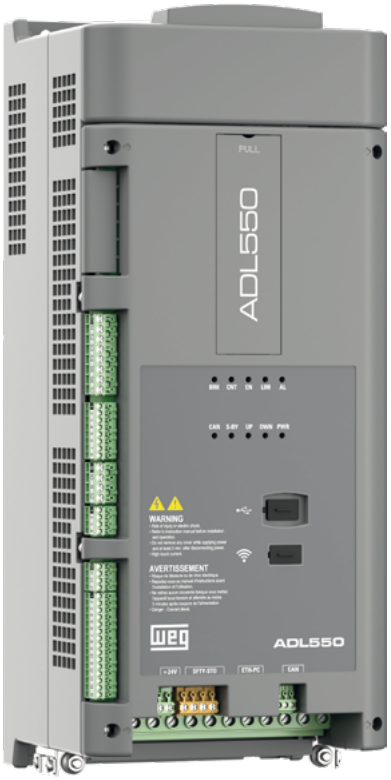
Vector inverter for lifts with synchronous/asynchronous motors

ADL510, ADL530, ADL550

Hardware and Startup
User Manual

Language: English



Information about this manual

The **ADL500 HW+QS** (Hardware and Startup User Manual) is a handy manual for mechanical installation, electrical connection and quick start-up.
The Function and parameter description manual (**code 1S95SWEN**) can be found on the WEG website, in the product page **Download Center** to the link below:
https://www.weg.net/catalog/weg/IT/en/p/MKT_WDC_GLOBAL_PRODUCT_INVERTER_FOR_ELEVATOR_ADL500

Firmware version
This manual is updated according to:
- Firmware version V 3.x.10
- Lift application, EFC V 3.x.3

Firmware compatibility / Regulation board version

Software Version	Regulation board	
	...-5	...-9
Before V 3.1.5	Ok	No
From V 3.1.5	Ok	Ok

The identification number of the firmware version can be read in the datamatrix (see section 2.3 of this manual) or on parameter PAR 174 **Firmware Version** (**DRIVE INFO** menu).

The identification number of the regulation board can be read out in parameter PAR 198 **Hardware version** (**DRIVE INFO** menu).

General information

NOTE!

In industry, the terms “Inverter”, “Regulator” and “Drive” are sometimes interchanged. In this document, the term “Drive” will be used.

Before using the product, read the safety instruction section carefully. Keep the manual in a safe place and available to engineering and installation personnel during the product functioning period.

WEG Automation Europe S.r.l. has the right to modify products, data and dimensions without notice. The data can only be used for the product description and they can not be understood as legally stated properties.

Thank you for choosing this WEG product.
We will be glad to receive any possible information which could help us improvingthis manual.
The e-mail address is the following: techdoc@weg.net

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1 - Safety Precautions

1.1 Symbols used in the manual

 WARNING!	Indicates a procedure, condition, or statement that, if not strictly observed, could result in personal injury or death.
 CAUTION!	Indicates a procedure, condition, or statement that, if not strictly observed, could result in damage to or destruction of equipment.
 ATTENTION!	Indicates a procedure, condition, or statement that should be strictly followed in order to optimize these applications.
NOTE!	Indicates an essential or important procedure, condition, or statement.

Qualified personnel
For the purpose of this Instruction Manual , a “Qualified person” is someone who is skilled to the installation, mounting, start-up and operation of the equipment and the hazards involved.
This operator must have the following qualifications:

- trained and authorized to install, clear, ground and tag circuits and equipment in accordance with established safety procedures.

Use for intended purpose only
The power drive system (electrical drive) may be used only for the application stated in the manual and only together with devices and components recommended and authorized by **WEG**.

1.2 Safety precaution

The following instructions are provided for your safety and as a means of preventing damage to the product or components in the machines connected. This section lists instructions, which apply generally when handling electrical drives. Specific instructions that apply to particular actions are listed at the beginning of each chapters.

Read the information carefully, since it is provided for your personal safety and will also help prolong the service life of your electrical drive and the plant you connect to it.

1.3 General warnings


WARNING!

This equipment contains dangerous voltages and controls potentially dangerous rotating mechanical parts. Non-compliance with warnings or failure to follow the instructions contained in this manual can result in loss of life, severe personal injury or serious damage to property.

The manufacturer’s safety locks and operating limits shall not be bypassed or modified.

Only suitable qualified personnel should work on this equipment, and only after becoming familiar with all safety notices, installation, operation and maintenance procedures contained in this manual. The successful and safe operation of this equipment is dependent upon its proper handling,installation, operation and maintenance.

In the case of faults, the drive, cannot ensure that the motor it drives does not move, so it must be ensured that the system is disconnected in the event of a fault from the mains supply.

Electrical Shock:

The DC link capacitors remain charged at a hazardous voltage even after cutting off the power supply.

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section "4.7 Voltage level of the inverter for safe operations" on page 16.

Electrical Shock and Burn Hazard:

When using instruments such as oscilloscopes to work on live equipment, the oscilloscope’s chassis should be grounded and a differential probe input should be used.

Fire and Explosion Hazard:

Drives may not be installed in areas classified as areas of increased risk in the event of fire or explosion and must therefore be installed outside these areas even if they are used with motors suitable for use in these areas.

WARNING!

The drive, in addition to the main power supply, depending on the configuration chosen to manage the elevator operation in the event of an emergency or blackout, is repowered through batteries or UPS. Therefore, make sure that before working on the drive, all other power supplies in addition to the main one have been disconnected, respecting the times imposed to ensure that the capacitors have discharged.

1.4 Instructions on compliance with US and Canadian safety regulations

Short circuit ratings
ADL500 inverters must be connected to a mains capable of supplying a symmetrical short-circuit power of less than or equal to “xxxx" Arms.

The values of the “xxxx” Arms short-circuit current, in accordance with UL / EN 61800-5-1 requirements, for each motor power rating (Pn mot in the manual) are shown in the table below.

Short current rating	
Pn mot (kW)	**SCCR (A)**
1,1...37,3	5000
39....149	10000

NOTE!

Drive mast be protected by semiconductor Fuse type as specified in the instruction manual.

Branch circuit protection
In order to protect drive against over-current use fuses specified in section **"5.1 - External fuses"**.

Environmental condition
The drive has to be considered “Open type equipment”. Max surrounding air temperature equal to 40°C.
Pollution degree 2. Additional details on operating temperatures can be found in section **"4.1 - Environmental conditions"**.

Wiring of the input and output terminals
Use cables with a minimum temperature of 75°C and crimp terminals (if necessary). If you choose to crimp terminals, use a tool recommended by the terminal manufacturer. Fasten the terminals with the tightening torque specified in section **"7.2.2 - Cable cross-sections"**.

All cables must be certified for use according to the Canadian Electrical Code, Part I (CSA C22.1) and the National Electrical Code (ANSI/NFPA 70), whichever is applicable.

Over-voltage control
For Canadian installations only (CSA requirements), the use of a COOPER BUSSMANN model SPP40SP3480PNG DIN rail snubber (or equivalent) is recommended on the power supply line, upstream of the drive.

Minimum time required for safe DC-link voltage
Before removing drive cover in order to access internal parts, after mains disconnection wait for time as follow:

Drive size	Safe time (sec)
1 - 2 - 3 - 4	300

Over-speed, over-load/current limit, motor overload
Drive incorporate over-speed, over-current/current limit, motor overload protection. Instruction manual specify degree of protection and detailed installation instruction.

1.5 Disclaimer

Any remote connection functions shall be used only under adequate security conditions, in compliance with current regulatory provisions and only by properly trained personnel. The evaluation of such conditions is up to the user.

2 - Introduction to the product

The **ADL500** is the result of WEG's experience in the civil lift engineering sector, gained from its commitment to working in close partnership with leading operators in the sector to develop technical solutions and application programs.
The ADL500 integrates **the most complete and advanced lift inverter technology**, for maximum synergy with the full range of installation requirements but, above all, to offer a cost-effective and immediate solution for lift control systems.
This drive is designed to power loads such as **asynchronous or synchronous** permanent magnet (brushless) motors, for applications in the lift sector. This compact drive is suitable for installation in cabinets for roomless applications.

ADL500 is available in three configurations designed to be perfect for each category of lift:

- **ADL550** for "High-end" buildings, advanced safety features (STO, SBT, SBC with EBC500 accessory), stand-by function with 24 Vdc external power supply, with an optional internal board for IO expansion and Serial communication.
- **ADL530** for "Medium-end" buildings, motor control with and without gearboxes, simple start-up wizard and quick troubleshooting features.
- **ADL510** for "Low-end" buildings or modernisations, easy to install, designed for motors with gearboxes, and optimised for open loop control.

			
	ADL510	**ADL530**	**ADL550**
Control mode	V/f open loop and closed loop Field oriented control closed loop (FOC)		
Motor Type	Asynchronous	Asynchronous, Synchronous	Asynchronous, Synchronous
Max Output Frequency	300Hz	300Hz	300Hz
Switching Frequency	10kHz (default)	10kHz (default)	10kHz (default)
Overload	183% x 10 s	183% x 10 s	183% x 10 s / 200% x 2 s
Braking Unit	Integrated	Integrated	Integrated
EMI filter	Integrated (ADL510-...-F models)	Integrated (ADL530-...-F models)	Integrated (ADL550-...-F models)
Choke	-	Integrated above 22kW	Integrated above 22kW
Power Range	-4: 4 ... 22 kW	-4: 4 ... 45 kW -2T: 5.5 ... 22 kW	-4: 4 ... 45 kW -2T: 5.5 ... 22 kW -2M: 1.1 ... 5.5 kW
Input Voltage Range	-4: 3 ph 400 Vac, 50/60 Hz	-4: 3ph 230-400-460-480 Vac, 50/60 Hz -2T: 3ph 200-230 Vac, 50/60 Hz	-4: 3ph 230-400-460-480 Vac, 50/60Hz -2T: 3ph 200-230 Vac, 50/60 Hz -2M: 1ph 200-230 Vac, 50/60 Hz
I/O (For more details see chapter 4.5)	8 digital inputs + 1 enable + 4 relay outputs + 1 analog input (used as speed reference)	8 digital inputs + 1 enable + 2 analog inputs (1 analog input for PTC motor thermal) +4 relay outputs	8 digital inputs + 1 enable + 2 analog inputs (1 analog input for PTC motor thermal) + 2 Fast (Freeze) inputs + 4 relay outputs
Optional expansion cards: • I/O (EXP-IO1-ADL500) card **(*)** • DCP3-DCP4 Protocols card (EXP-DCP-ADL500) **(*)**	- -	- -	Yes (4 digit. input + 2 digit. output) Yes
Encoder (**)	TTL and HTL (digital or sinusoidal) + Repetition (Incremental)	TTL and HTL (digital or sinusoidal), ENDAT, SINCOS, BISS, SSI + Repetition (Inc.)	TTL and HTL (digital or sinusoidal), ENDAT, SINCOS, BISS, SSI + Repetition (Inc.)
USB 2.0 port	-	Yes	Yes
Ethernet port (100 Mbit/s)	Yes	Yes	Yes
Wi-Fi port	-	Yes	Yes
Wi-Fi external module	-	Yes (optional)	Yes (optional)
CANopen Lift 417	-	Yes	Yes
Safety STO (SIL3 – PLe)	-	-	Yes
Safe Brake Test (SBT)	-	-	Yes
+ 24 VDc External	-	-	Yes
Combination with the electronic brake EBC	-	-	Yes
KB-ADL500 programming keypad	Yes (optional)	Yes (optional)	Yes (optional)
Removable terminals (Regulation section)	Yes	Yes	Yes
Diagnostic Leds	BRK, CNT, EN, LIM, AL	BRK, CNT, EN, LIM, AL, CAN	BRK, CNT, EN, LIM, AL, CAN, S-BY, UP, DWN, PWR

(*) Only one of the two boards can be installed. (**) For detailed info regards HTL encoder supported refer to chapter 7.3.3.

2.1 Dedicated features

			
	ADL510	**ADL530**	**ADL550**
Wi-Fi communication Plug-in for optional Wi-Fi Drive Link module for wireless communication via WEG_Liftouch APP or WEG_DriveLabs.	-	Yes	Yes
WEG_LifTouch (App) Fully responsive App, compatible with all major browsers on smartphones, tablets and PCs, and with any operating system.	Yes (via ETH)	Yes (via Wi-Fi or ETH)	Yes (via Wi-Fi or ETH)
WEG_DriveLabs (Configurator) Enhancement of WEG PC configurator features in the same "family feeling" programming. Includes an integrated real-time oscilloscope and 4 different levels of access.	Yes	Yes	Yes
USB PORT USB port for import/export of inverter files, motor pre-configuration files and selection of language.	-	Yes	Yes
ETHERNET PORT RJ-45 port for configuration via PC using the Modbus TCP/IP protocol. Can also be used to connect the inverter to a router for remote control.	Yes	Yes	Yes
GREEN SOLUTIONS AND FEATURES Stand-by feature that deactivates the power section when the system is stopped.	-	-	Yes
Emergency power supply Battery supply for emergency operation -EMS version: direct battery connection to the drive with no aux voltage supply -UB version: battery connection with the necessity to use external 270 Vdc ±10% auxiliary voltage supply - 230 V single-phase supply voltage for the return to the car floor via a UPS	Yes (with -EMS or -UB version)	Yes (with -EMS or -UB version)	Yes (with -EMS or -UB version)
Speed control EFC (Elevator Floor Control) function: separate function for independent management of short floors, landing zone, re-starting with lift not at floor and automatic deceleration point calculation.	Yes	Yes	Yes
Position control EPC (Elevator Positioning Control) function: separate function for independent management of direct arrival at the floor with internal position regulator and saving of floor distances (system autotuning). In preparation.	-	-	Yes
Lift sequence Typical sequence of input/output signals used in civil lift engineering applications such as I/O management, braking, output contactor and door control.	Yes	Yes	Yes
Anti rollback The anti rollback function allows a synchronous motor start without counter-rotation.	-	Yes	Yes
Parameters in linear unit Possibility of selecting different engineering units for the main movement parameters, Hz, rpm or m/s for speed, m/s^2, m/s^3 for cabin acceleration.	Yes	Yes	Yes
Lift mechanical parameters Mechanical system parameters such as pulley diameter and speed ratio for converting system units and weights, system for calculating inertia and speed regulation for the desired response.	Yes	Yes	Yes
Ramp generation Independent configuration of acceleration and deceleration ramp parameters and of the 4 jerk values for maximum travelling comfort in the lift cabin. Dedicated deceleration ramp corresponding to the stop command.	Yes	Yes	Yes
Multiple speeds 8 internally settable speed reference values. Possibility of overwriting at start-up with additional values to ensure smooth starting.	Yes	Yes	Yes
Pre-torque (load compensation) Initilization of the speed regulator by the weight sensor to prevent jerks or bumpy starting.	-	Yes	Yes
Increased overload Overload capacity in line with typical lift application load cycles.	Yes	Yes	Yes
Fan control logic The fan control logic activates the internal fans according to the temperature.	Yes	Yes	Yes
User-friendly menus The menus feature lift-specific DISPLAY and motor STARTUP terminology.	Yes	Yes	Yes
Combination with the electronic brake EBC In combination with the contactorless configuration, the use of the electronic brake also eliminates the brake contactors and manages and monitors the current passing in the brake coils.	-	-	Yes
Saving parameters Drive parameters can be saved on USB memory or APP. Drive parameters can be saved on Keypad.	- Yes	Yes Yes	Yes Yes

2.2 Components identification

The inverter converts the constant frequency and voltage of an existing three-phase network into DC voltage, from which it obtains a new three-phase network with variable voltage and frequency. With this variable three-phase network the speed of three-phase asynchronous and synchronous motors can be controlled continuously.

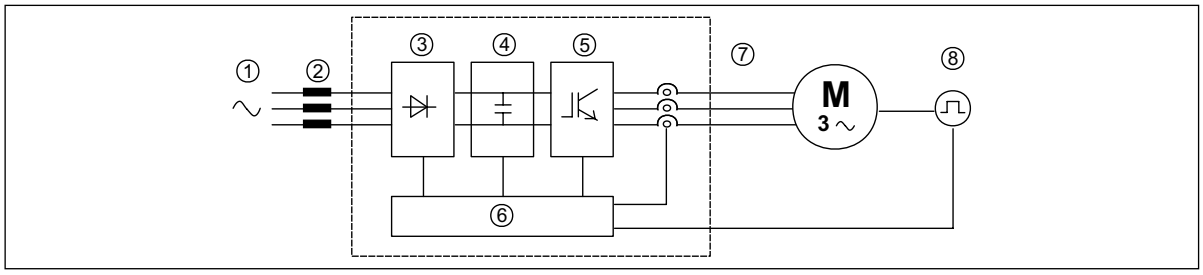


Figure 2.2.1: Drive block diagram

1. **Mains supply voltage**
2. **Mains choke** (see section **"5.2 - Input chokes"**)
3. **Three-phase rectifier bridge**
   Converts AC voltage into DC voltage via a three-phase full wave bridge.
4. **Intermediate circuit**
   With pre-load resistor and levelling capacitors DC voltage (U_{DC}) =√2 x mains voltage (U_{LN}).
5. **IGBT inverter bridge**
   Converts DC voltage into three-phase AC voltage with variable amplitude and frequency.
6. **Configurable control section**
   Cards for controlling and regulating the closed and open-loop power section. Commands, references and reactions are connected to these.
7. **Output voltage**
   Three-phase AC voltage.
8. **Motor and speed feedback encoder**
   (see section **"7.3.3 - Feedback Connection"**).

2.3 Product identification

The basic technical data of the inverter are included in the product code, data plate and on DataMatrix code.
In addition, the firmware version, the application version and other information such as the power board version and serial number and the control board serial number can be read in the dedicated parameters of the **DRIVE INFO** menu.

The inverter must be selected according to the rated current of the motor.
The rated output current of the drive must be higher than or equal to the rated current of the motor used.
The speed of the asynchronous motor depends on the number of pole pairs and frequency (plate and catalog data).
If using a motor at speeds above the rated speed, contact the motor manufacturer for any related mechanical problems (bearings, unbalance, etc.). The same applies in case of continuous operation at frequencies of less than approx. 20 Hz (inadequate cooling, unless the motor is provided with forced ventilation).

NAME OF MODEL (CODE)

ADL5## - ### - #### - ### - # - ## - #### - ## - ####

SW/HW personalization:
[empty] = standard software
[not empty] = SW/HW personalisation

IT version:
[empty] = not included
IT = included

Emergency supply module:
[empty] = only UPS
UB = UPS or Battery + aux voltage supply (new standard)
EMS = UPS or direct battery connection without aux voltage supply

Rated voltage:
4 = 230 Vac - 400 Vac - 480 Vac, three-phase
2T = 200 Vac, three-phase
2M = 200 Vac, single-phase

EMI Filter:
[empty] = not included
F = included

Lift application:
L = standard LIFT application
X = other applications (TBD)

Braking unit:
X = not included
B = included

Keypad:
X = not included
K = included

Inverter power in kW:

011 = 1.1 kW	**110** = 11 kW
015 = 1.5 kW	**150** = 15 kW
022 = 2.2 kW	**185** = 18.5 kW
030 = 3 kW	**220** = 22 kW
040 = 4 kW	**300** = 30 kW
055 = 5.5 kW	**370** = 37 kW
075 = 7.5 kW	**450** = 45 kW

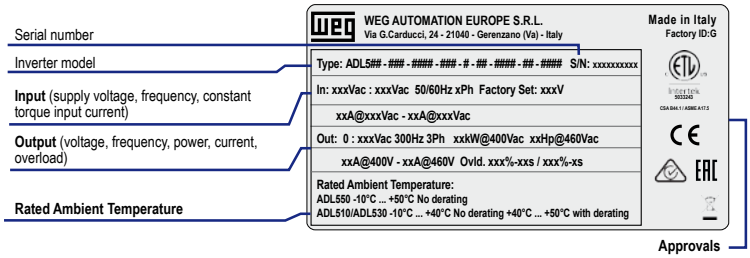
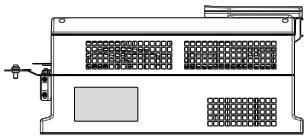
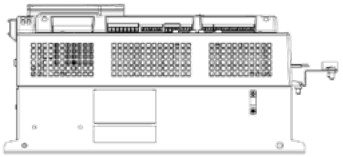
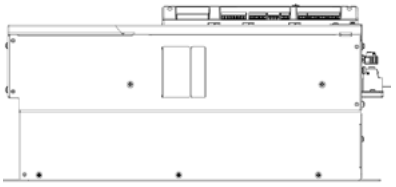
Drive mechanical dimensions:
1 = size 1
2 = size 2
3 = size 3
4 = size 4

Integrated control system:
[empty] = not included
ICS = included

Inverter series:
50
30
10

Available power sizes for emergency versions

-4	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	30	37	45
ADL510/530/550-...					■	■	■	■	■					
ADL510/530/550-...-EMS					■	■	■	■	■					
ADL510/530/550-...-UB					■	■	■	■	■	■	■	■	■	■
-2T	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	30	37	45
ADL510/530-...						■	■							
ADL510/530-...-EMS						■	■							
ADL510/530-...-UB						■	■	■	■	■	■			
-2M	1.1	1.5	2.2	3	4	5.5	7.5	11	15	18.5	22	30	37	45
ADL550-...-EMS	■	■	■	■										
ADL550-...-UB	■	■	■	■	■	■								

Data plate	Position on the drive
	 Size 1 - 2  Size 3  Size 4

DataMatrix code

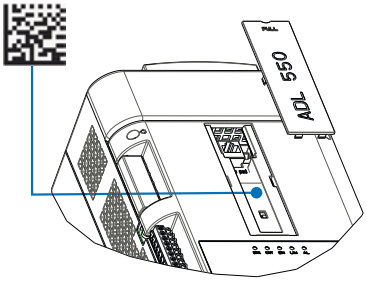
Two-dimensional matrix barcode, contains the following information:

- code
- type
- serial number
- versions of HMI firmware and DSP application firmware
- EFC application
- hardware revision

The code can be read by smartphones using dedicated applications or with specific industrial readers.

I.e.:

S9DL5565. ADL550-2150-XBL-F-4-EMS. 41GE038956 - Fw. 222 210 Appl. EFC 2.2.0 REV. HW A1



3 - Transport and storage

WARNING!

If the Drives have been stored for longer period, but not more than two years, the operation of the DC link capacitors may be impaired and must be “reformed” connecting them to a power supply for two hours with no load connected in order to regenerate the capacitors, (the input voltage has to be applied without enabling the drive).

For periods longer than 2 years a dedicate procedure is to follow; details about this procedures are available on request.

WARNING!

Correct transport, storage, erection and mounting, as well as careful operation and maintenance are essential for proper and safe operation of the equipment.

Protect the inverter against physical shocks and vibration during transport and storage. Also be sure to protect it against water (rainfall) and excessive temperatures.

3.1 General

A high degree of care is taken in packing the **ADL Drives** and preparing them for delivery.
They should only be transported with suitable transport equipment (see weight data). Observe the instructions printed on the packaging. This also applies when the device is unpacked and installed in the control cabinet.

Upon delivery, check the following:
- the packaging for any external damage;
- whether the delivery note matches your order.

Open the packaging with suitable tools. Check whether:
- any parts were damaged during transport;
- the device type corresponds to your order.

In the event of any damage or of an incomplete or incorrect delivery please notify the responsible sales offices immediately.
The devices should only be stored in dry rooms within the specified temperature ranges.

NOTE!

A certain degree of moisture condensation is permissible if this arises from changes in temperature. This does not, however, apply when the devices are in operation. Always ensure that there is no moisture condensation in devices that are connected to the power supply!

3.2 Permissible Environmental Conditions

Temperature:

Storage	-25…+55°C (-13…+131°F)
	-20…+55°C (-4…+131°F), for devices with keypad
Transport	-25…+70°C (-13…+158°F)
	-20…+60°C (-4…+140°F), for devices with keypad

Air humidity:

Storage	5% to 95 %, 1 g/m^3 to 29 g/m^3
Transport	max 95 % [3], 60 g/m^3 [4]

A light condensation of moisture may occur for a short time occasionally if the device is not in operation.

Air pressure:

Storage	[kPa] 86 to 106
Transport	[kPa] 70 to 106

[3] Greatest relative air humidity occurs with the temperature @ 40°C (104°F) or if the temperature of the device is brought suddenly from -25 ...+30°C (-13°...+86°F).

[4] Greatest absolute air humidity if the device is brought suddenly from 70°C to15°C (158°F to 59°F).

4 - Specification

4.1 Environmental Conditions

Installation location Pollution degree 2 or lower (free from direct sunligth, vibration, dust, corrosive or inflammable gases, fog, vapour oil and dripped water, avoid saline environment).

Installation altitude Max 2000 m (6562 feet) above sea level. With 1.2% reduction in output current for every 100 m starting from 1000 m.

Mechanical cond. for installation Vibrational stress: EN 61800-2 Class 3M1.

Operating temperature **ADL510, ADL530 size 1-2-3:**
-10…+40°C (+32…104°F) without derating.
+40 ... +50°C (+104 … 122°F) with 1% derating every °C starting from 40°C and up to 50°C.
ADL550 size 1-2-3:
-10…+50°C (32°…122°F) without derating.
ADL530, ADL550 size 4:
-10…+45°C (+32 …113°F) without derating.
+45 ... +50°C (+113 … 122°F) with 1% derating every °C starting from 45°C and up to 50°C.

Air humidity (operating) From 5 % to 85 % and from 1 g/m^3 to 25 g/m^3 with no humidity (or condensation).

Air pressure (operating) From 70 to 106 kPa.

Storage CEI EN 61800-2 Class 1K4, CEI EN 61800-2 Class 1K3.

Maximum period of inactivity 12 months.

4.2 Standards

Climatic conditions EN 60721-3-3

Electrical safety EN 61800-5-1, UL/IEC 61800-5-1, ASME17.5/CSA B44.1

EMC compatibility EN 12015* (with integrated filter), EN 12016, IEC/EN 61800-3

* Must be guaranteed by the installer in the final equipment.

Protection degree IP20

Approvals

			ON PROGRESS
ADL510/530/550	Size 1-2, -4/-2T, std/EMS	CE cULus EAC	
ADL510/530/550	Size 3, -4/-2T, UB	CE	
All the other models		CE	

EC Directive Compliance LVD 2014/35/EU, EMC 2014/30/EU, Lift 2014/33/EU, RoHS 2011/65/EU, Reach (1907/2006)

Other elevator standards EN 81-20, EN 81-50

North America Safety standards ASME 17.1/CSA B44.1

4.3 Control modes

Motor control modes Open loop scalar V-f control for IM motors (OL-VF)
Closed loop field-oriented control for IM motors (FOC-IM)
Closed-loop field-oriented control for permanent magnet synchronous motors (FOC-PMSM)

4.4 Precision

4.4.1 Speed control

Speed control precision	Flux vector CL control (FOC) with feedback: 0.01 % motor rated speed Open loop scalar V-f control (OL-VF) : ± 60 % rated slip of motor

4.4.2 Speed control limits

Speed range (*)	± 32000 rpm
Speed format (*)	32 bit
Frequency range	± 2000 Hz
Max frequency	Flux vector CL control with feedback and brushless: 300Hz, FVOL: 150 Hz, VF: 600 Hz
Min frequency	0 Hz

(*) referred to **Full scale speed**, PAR 680.

4.4.3 Torque control

Torque resolution (*)	> 0.1 %
Torque control precision (*)	Flux vector CL with feedback: ± 3%, Flux vector OL with feedback: ± 6%
Direct torque control	Yes
Current limitation	Limits ±, Mot/gen limits, Variable limits

(*) Referred to rated torque.

4.4.4 Current rating

Overload	**ADL550**: 183% x 10 sec and 200% x 2 sec (output frequency from 0 Hz); CDF (Cyclic duration factor - Cycle S4 IEC 60034-1): 40%. **ADL530 and ADL510**: 183% *10 sec (output frequency from 0 Hz); CDF (Cyclic duration factor - Cycle S4 IEC 60034-1): 40%.
Switching frequency	10 kHz (default) and 5 KHz *The switching frequency is managed by the control algorithm in relation to the drive temperature, frequency and current.*

4.5 Input electrical data

Type of networks

Connection to TT and TN Networks	Yes, standard version.
Connection to IT Networks or Regenerative	Only on request (*), please contact the WEG Customer Service.
Input voltage U_{LN}	**ADL550/530 -4**: three-phase 230-400-460-480 Vac -15% +10% **ADL510-4**: three-phase 400 Vac -15% +10% **ADL550/530 -2T**: three-phase 200-230 Vac -10% +10% **ADL550-2M**: single-phase 200Vac -10% +10% - 230Vac -15% +10%
Maximum input voltage unbalance	3%
Choke	Sizes 1...2: Optional (DC or AC)

NOTE! See chapter **"5.2 Input chokes"** for THD values in accordance with EN 12015 and for selection of external inductances.

Size	Input voltage ULN	Input frequency	THD with DC inductance	Threshold of overvoltage	Threshold of undervoltage	Effective input current I_N (@ In out)			DC-Link capacity
	[Vac]	[Hz]	[@ in out]	[Vdc]	[Vdc]	@ 230 Vac [A]	@ 400 Vac [A]	@ 480 Vac [A]	[μF]
ADL5xx - ... - 4, 3ph									
1040	three-phase 230 - 400 - 480 Vac -15% +10%	50/60 Hz ± 5%	< 35% (in accordance with EN 12015)	820 Vdc	@ 480 Vac = 470 Vdc	12	11	10	470
1055						17	16	15	680
1075						23	22	20	680
2110					@ 460 Vac = 450 Vdc	31	29	26	1020
2150						42	40	37	1500
3185					@ 400 Vac = 391 Vdc	50	47	45	2250
3220						55	53	50	2700
4300						55	55	49	2350
4370					@ 230 Vac = 225 Vdc	72	72	65	3000
4450						89	89	81	3750
ADL5xx - ... - 2T, 3ph									
2055	three-phase 200 - 230 Vac ±10%	50/60 Hz ± 5%	< 35% (in accordance with EN 12015)	500 Vdc	@ 200 Vac = 196 Vdc	31	-	-	1020
2075						42	-	-	1500
3110						55	-	-	2700
4150					@ 230 Vac = 225 Vdc	55	-	-	2250
4185						72	-	-	3000
4220						89	-	-	3750
ADL5xx - ... - 2M, 1ph									
1011	single-phase 200 Vac -10% +10% single-phase 230 Vac -15% +10%	50/60 Hz ± 5%	-	410 Vdc	@ 200 Vac = 196 Vdc	16	-	-	2200
1015						18	-	-	2200
2022						24	-	-	4050
2030					@ 230 Vac = 225 Vdc	31	-	-	4050
3040						35	-	-	4950
3055						50	-	-	4950

(*) ADL500 can only operate devoid of any faults (between active parts and PE) or in the presence of temporary faults.
Therefore an insulation monitor MUST be used to detect and enable prompt removal of any fault condition.

Insulation monitor

Since the **ADL500** drive is normally used in a ground-insulated system (IT), in accordance with IEC 61557-8, use of insulation resistance monitoring is required.

The monitoring system must be able to detect insulation loss, both on the AC and DC power supply sides and on the motor side.

A ground fault must be promptly detected and removed as quickly as possible to avoid damage to either the inverter or the entire system as a unit (in the event of insulation loss, the drive must be immediately disabled and disconnected from power sources).

The insulation monitor must be selected on a case-by-case basis according to the power supply, connection system and type of drive.

ATTENTION!

The insulation monitor must be plugged into the main power supply (if ADL500 is AC powered) or the DC side (if ADL500 is DC-powered).

The insulation monitor alarm threshold should be set to the highest possible resistance value.

4.6 Output electrical data

Maximum output voltage U2 _____ 0.98 x ULN (ULN = AC input voltage)
Maximum output frequency f2 _____ 300 Hz

The derating factors shown in the table below are applied to the rated DC output by the user.
They are not automatically implemented by the drive: Idrive = In x KALT x KT.

Size	In Rated output current (fsw = default)			PN mot (Recommended motor power, fsw = default)			Reduction factor			IGBT braking unit
	@ULN = 230VAC	@ULN = 400VAC	@ULN = 460VAC	@ULN = 230VAC	@ULN = 400VAC	@ULN = 460VAC	KT ADL550	KT ADL510 ADL530	KALT	
	[A]	[A]	[A]	[kW]	[kW]	[Hp]	(1)	(2)	(3)	
ADL5xx - ... - 4, 3ph										
1040	9	9	8.1	2	4	5	1	0.90	1.2	Standard internal (with external resistor); braking torque 150% MAX
1055	13.5	13.5	12.2	3	5.5	7.5	1	0.90	1.2	
1075	18.5	18.5	16.7	4	7.5	10	1	0.90	1.2	
2110	24.5	24.5	22	5.5	11	15	1	0.90	1.2	
2150	32	32	28.8	7,5	15	20	1	0.90	1.2	
3185	39	39	35.1	9	18.5	25	1	0.90	1.2	
3220	45	45	40.5	11	22	30	1	0.90	1.2	
4300	60	60	54	15	30	40	0.95	0.95	1.2	
4370	75	75	67.5	18.5	37	50	0.95	0.95	1.2	
4450	90	90	81	22	45	60	0.95	0.95	1.2	

Size	In Rated output current (fsw = default)	PN mot (Recommended motor power, fsw = default)		Reduction factor			IGBT braking unit
	@ULN = 200-230VAC	@ULN = 200-230VAC	@ULN = 200-230VAC	KT ADL550	KT ADL510 ADL530	KALT	
	[A]	[kW]	[Hp]	(1)	(2)	(3)	
ADL5xx - ... - 2T, 3ph							
2055	24.5	5.5	7.5	1	0.90	1.2	Standard internal (with external resistor); braking torque 150% MAX
2075	32	7,5	10	1	0.90	1.2	
3110	45	11	15	1	0.90	1.2	
4150	60	15	20	0.95	0.95	1.2	
4185	75	18.5	25	0.95	0.95	1.2	
4220	90	22	30	0.95	0.95	1.2	

Size	In Rated output current (fsw = default)	PN mot (Recommended motor power, fsw = default)	Reduction factor		IGBT braking unit
	@ULN = 230VAC	@ULN = 230VAC	KT ADL550	KALT	
	(A)	(kW)	(1)	(3)	
ADL5xx - ... - 2M, 1ph					
1011	6	1.1	1	1.2	Standard internal (with external resistor); braking torque 150% MAX
1015	6.8	1.5	1	1.2	
2022	9.6	2.2	1	1.2	
2030	13	3	1	1.2	
3040	15	4	1	1.2	
3055	22	5.5	1	1.2	

(1) **Kt (ADL550)**: size 1, 2, 3 no derating. Size 4 derating of 0,95 factor for ambient temperature of 50°C (1% every °C above 45°C);
(2) **Kt (ADL510/ADL530) size 1, 2, 3, 4**: Derating factor for ambient temperature of 50°C (1% every °C above 40°C for size 1, 2, 3; above 45°C for size 4);
(3) **Kalt**: Derating factor for installation at altitudes above 1000 meters a.s.l. Value to be applied = 1.2% each 100 m increase above 1000 m. E.g.: Altitude 2000 m, Kalt = 1.2% x 10 = 12% derating; In derated = (100 - 12)% = 88% In.

4.6.1 Derating values in overload condition

In overload conditions the output current **DO NOT** depends on the output frequency, as shown in the figure below.

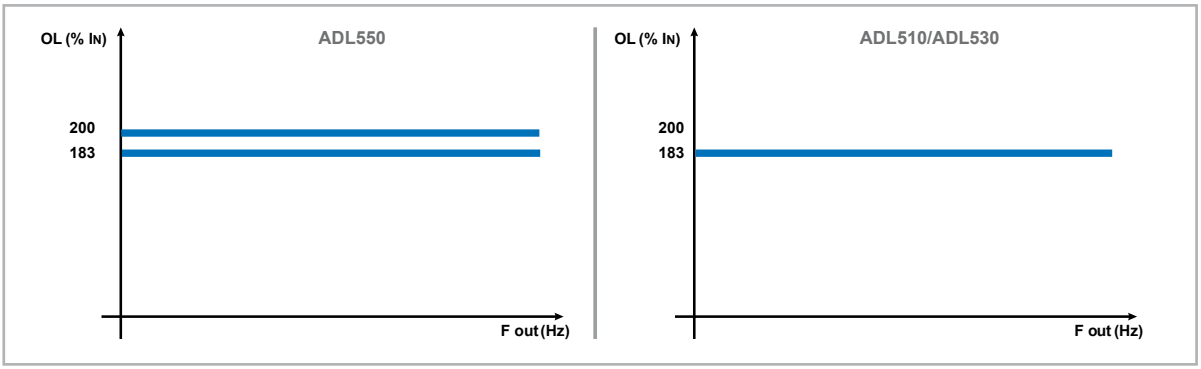


Figure 4.6.1: Ratio between overload/output frequency (ADL500-...-4)

4.6.2 Derating values for switching frequency

The switching frequency is modified according to the inside temperature of the drive, as shown in the figure below.

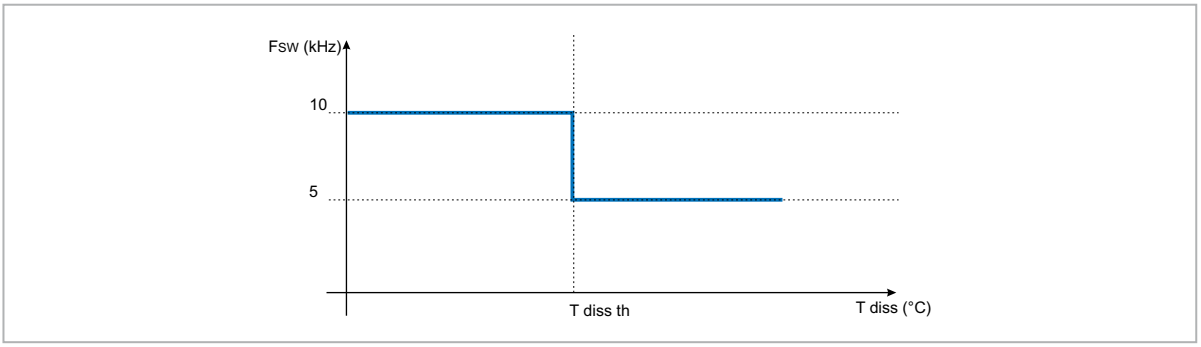


Figure 4.6.2: Ratio between switching frequency/heat sink temperature

4.6.3 KT: Ambient temperature reduction factor

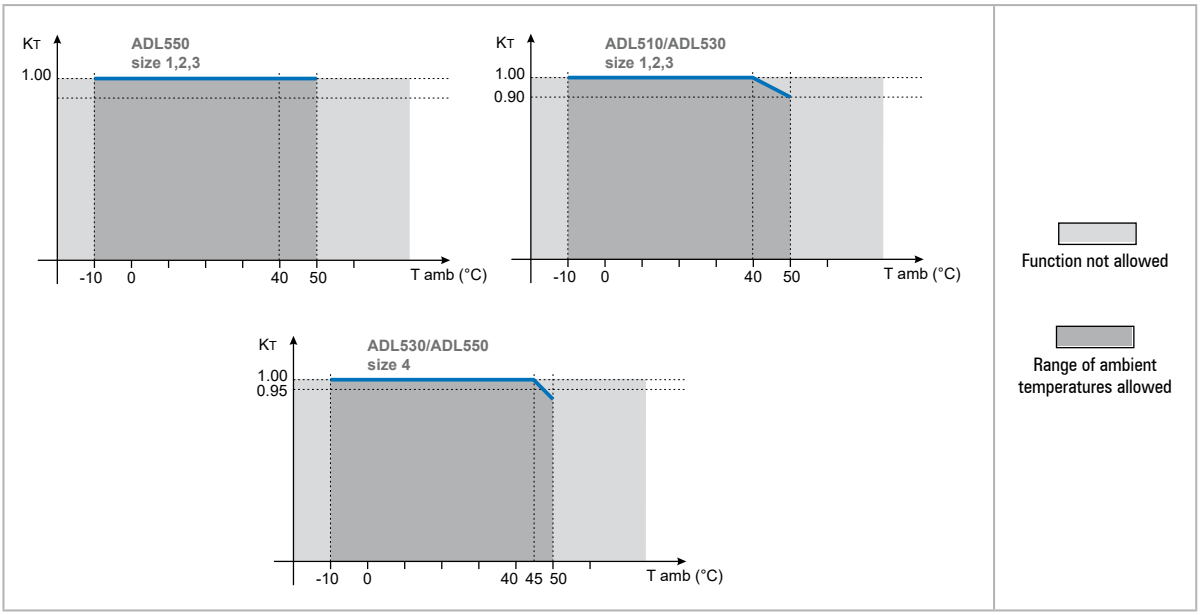


Figure 4.6.3: Tamb reduction coefficient

4.7 Voltage level of the inverter for safe operations

The minimum time between the moment in which an **ADL500** inverter is disabled from the mains and that in which an operator can operate on internal parts of the inverter, without the danger of electric shock, is 5 minutes.

This value takes into account the time to turn off an inverter supplied at 460Vac + 10%, without any options (time indicated for disabled inverter condition).

4.8 No-load consumption (Energy rating)

Size	No. of pre-loads allowed	Power-on time [s]	Idle(*) consumption "Fan Off" [W]	Fan consumption [W]	Idle(*) consumption "Fan On" [W]
ADL5xx - ... - 4, 3ph					
1040	1 each 20 s	about 5	20	8	28
1055			20	10	30
1075			20	10	30
2110			20	10	30
2150			20	16	36
3185			20	16	36
3220			20	16	36
4300			32	21	53
4370			32	32	64
4450			32	32	64
ADL5xx - ... - 2T, 3ph					
2055	1 each 20 s	about 5	20	8	28
2075			20	16	36
3110			20	16	36
4150			25	25	45
4185			25	36	56
4220			25	36	56
ADL5xx - ... - 2M, 1ph					
1011	1 each 20 s	about 5	20	10	30
1015			20	10	30
2022			20	10	30
2030			32	21	53
3040			32	32	64
3055			32	32	64

(*) Idle = drive powered by three-phase power supply and ready to start.

4.9 Cooling

All inverters are equipped with internal fans.

Size	Pv (Heat dissipation) (*)	Fan capacity	
	@U_{LN}=230 ... 460V_{AC} [W]	Heat sink [m^3/h]	Internal [m^3/h]
ADL5xx - ... - 4, 3ph			
1040	150	2 x 35	-
1055	250	2 x 58	-
1075	350	2 x 58	-
2110	400	2 x 58	-
2150	600	2 x 58	-
3185	600	2 x 104	-
3220	700	2 x 104	-
4300	940	2 x 98	2 x 187
4370	1120	2 x 187	2 x 63
4450	1500	2 x 187	2 x 63
ADL5xx - ... - 2T, 3ph			
2055	250	2 x 58	-
2075	350	2 x 58	-
3110	400	2 x 104	-
4150	620	2 x 98	2 x 63
4185	755	2 x 187	2 x 63
4220	980	2 x 187	2 x 63
ADL5xx - ... - 2M, 1ph			
1011	70	2 x 58	-
1015	80	2 x 58	-
2022	130	2 x 58	-
2030	170	2 x 58	-
3040	200	2 x 104	-
3055	290	2 x 104	-

(*) Values refer to the switching frequency under default conditions.

4.10 Weights and dimensions

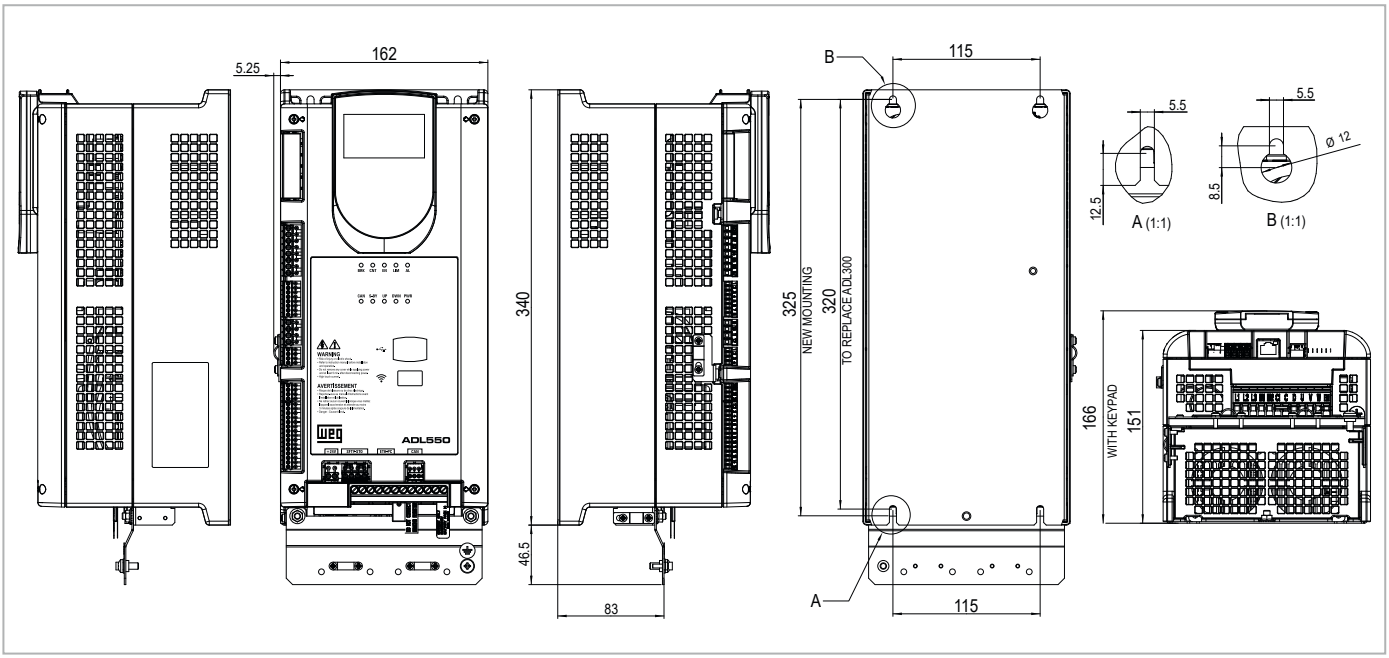


Figure 4.10.1: Size 1 - dimensions

Sizes	Dimensions: Width x Height x Depth		Weight	
	[mm]	[inches]	[kg]	[lbs]
ADL510-1... ADL530-1... ADL550-1...	162 x 340 x 151	6.38 x 13.38 x 5.9	5.5	12.1

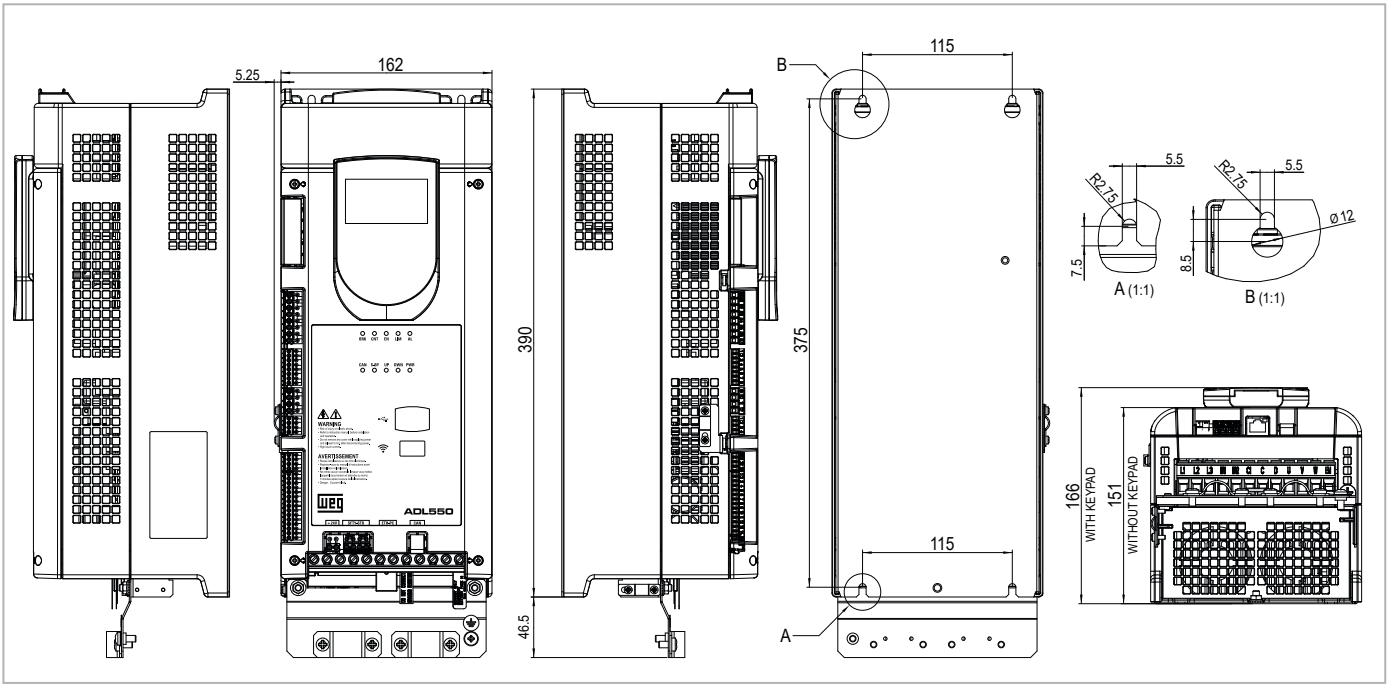


Figure 4.10.2: Size 2 - dimensions

Sizes	Dimensions: Width x Height x Depth		Weight	
	[mm]	[inches]	[kg]	[lbs]
ADL510-2... ADL530-2... ADL550-2...	162 x 390 x 151	6.38 x 15.35 x 5,94	7.0	15.4

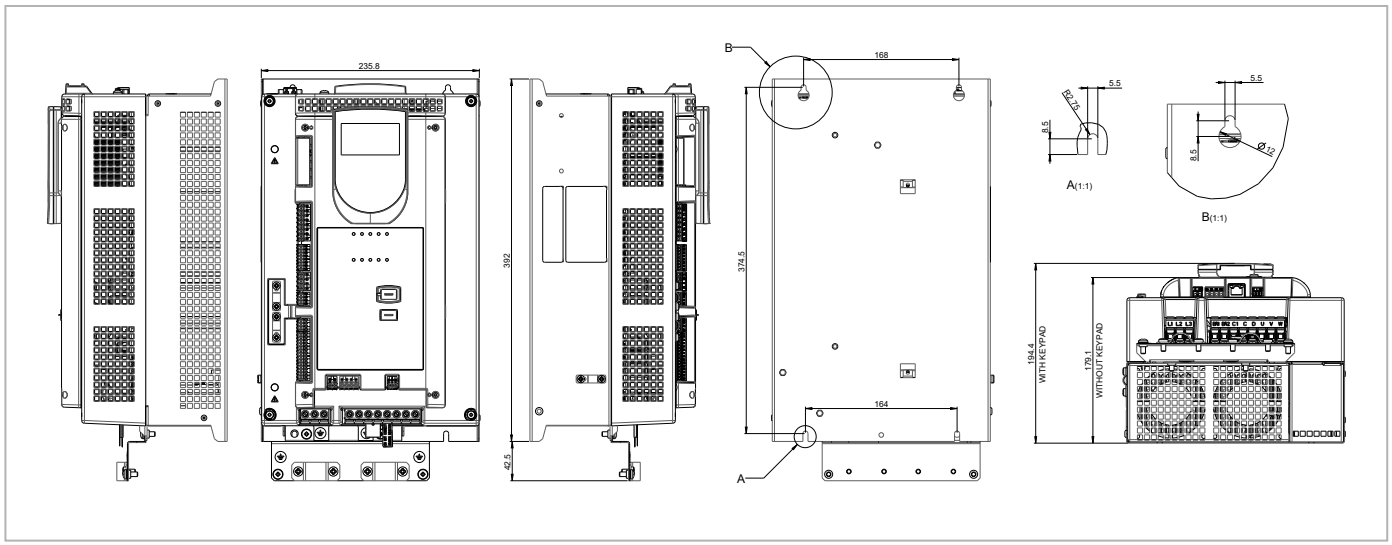


Figura 4.10.3: Size 3 - dimensions

Sizes	Dimensions: Width x Height x Depth		Weight	
	[mm]	[inches]	[kg]	[lbs]
ADL510-3... ADL530-3... ADL550-3...	235.8 x 392 x 179.1	9.28 x 14.5 x 7	10.0	22.05

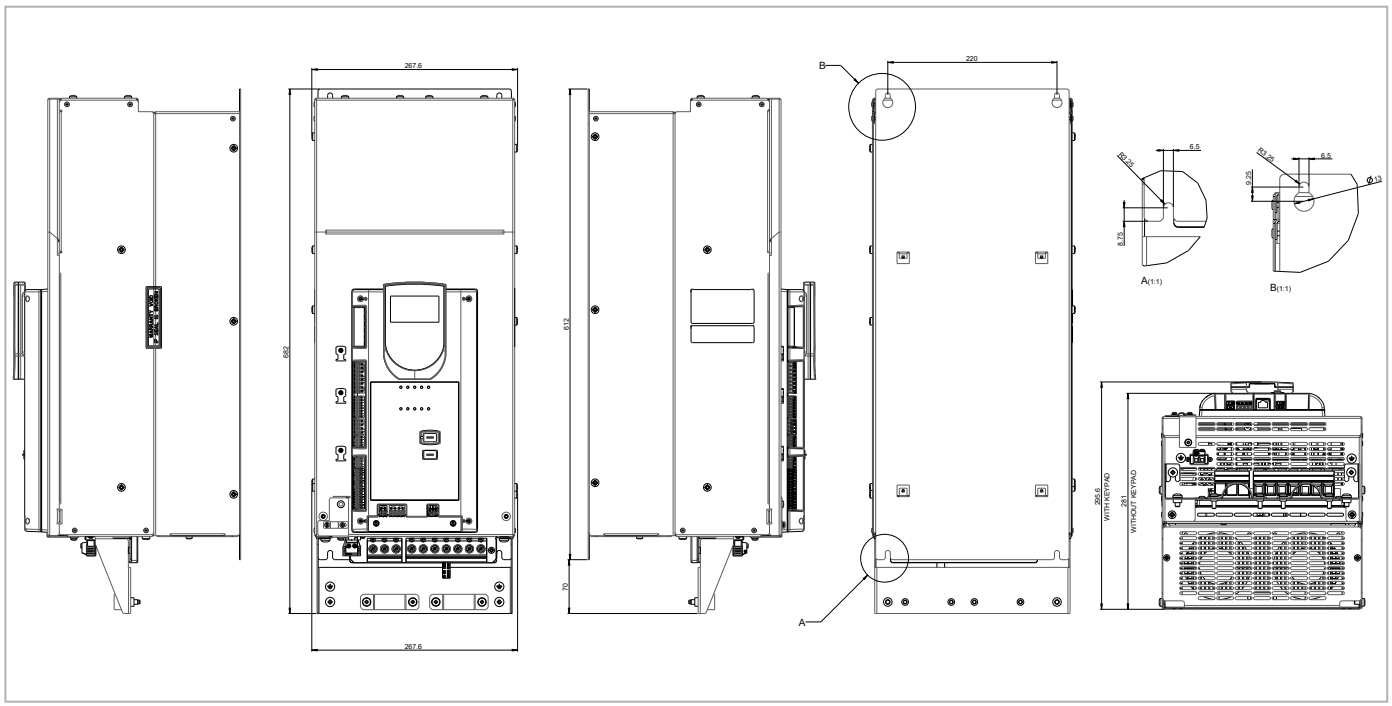


Figura 4.10.4: Size 4 - dimensions

Sizes	Dimensions: Width x Height x Depth		Weight	
	[mm]	[inches]	[kg]	[lbs]
ADL530-4... ADL550-4...	268 x 615 x 281	15.6 x 24.2 x 11	32	70.6

5 - Options

5.1 External fuses

5.1.1 Network side fuses (F1)

The inverter must be fused upstream on the network side.
Use fast-acting fuses only.

Size	EUROPE		AMERICA	
	Type	Code	Type	Code
ADL5xx - ... - 4, 3ph				
1040	GRD2/20	F4D15	A70P20	S7G48
1055	GRD2/25	F4D16	A70P25	S7G51
1075	GRD3/35	F4D20	A70P40	S7G52
2110	Z22GR40	F4M16	A70P40	S7G52
2150	Z22GR63	F4M17	A70P60-4	S7I34
3185	Z22GR80	F4M19	A70QS80-4	S7197
3220	Z22GR80	F4M19	A70QS80-4	S7197
4300	Z22GR80	F4M19	A70QS80-4	S7197
4370	Z22GR100	F4M21	A70QS100-4	S7198
4450	Z22GR100	F4M21	A70QS100-4	S7198
ADL5xx - ... - 2T, 3ph				
2055	Z22GR40	F4M16	A70P25	S7G51
2075	Z22GR40	F4M16	A70P40	S7G52
3110	Z22GR80	F4M19	A70QS80-4	S7197
4150	Z22GR80	F4M19	A70QS80-4	S7197
4185	Z22GR100	F4M21	A70QS100-4	S7198
4220	Z22GR100	F4M21	A70QS100-4	S7198
ADL5xx - ... - 2M, 1ph				
1011	GRD2/25	F4D16	A70P25	S7G51
1015	GRD2/25	F4D16	A70P25	S7G51
2022	Z22GR40	F4M16	A70P40	S7G52
2030	Z22GR40	F4M16	A70P40	S7G52
3040	Z22GR63	F4M17	A70QS60-4	S7196
3055	Z22GR80	F4M19	A70QS80-4	S7197

Technical data for fuses, including dimensions, weights, power leakage, fuse carriers etc. are reported in the corresponding manufacturers' data sheets: GRD... (Size E27), Z22... = Jean Müller, Eltville; A70...= Ferraz.

5.2 Input chokes

In accordance with EN 12015, to obtain THD values < 35%, provide DC input inductance (see section **"5.2.1 - DC input chokes"**).

The **AC input chokes** are strongly recommended in order to:

- limit the RMS input current of the ADL500 inverter;
- increase the life of intermediate circuit capacitors and reliability of input diodes;
- reduce mains harmonic content;
- reduce problems due to power supply via a low impedance line (≤ 1%).

5.2.1 DC input chokes

Size	Effective input current In (with external DC chokes)			External DC chokes					
	@230 V / 50 Hz	@400 V / 50 Hz	@480 V / 50Hz	Rated current	Overload current	Model	Code	Dimensions Width x Height x Depth	Weight
	[A]	[A]	[A]	[Arms]	(*) [Arms]			mm [inches]	kg [lbs]
ADL5XX - ... - 4, 3ph									
1040	8	8	7.5	10	20	LDC-004	S7AI10	99 x 96 x 93 [3.90 x 3.78 x 3.66]	2.4 [5.3]
1055	12	12	11	16	31	LDC-005	S7AI11	125 x 112 x 98 [4.92 x 4.41 x 3.86]	4.1 [9.0]
1075	16	16	14	21	41	LDC-007	S7AI12	125 x 127 x 122 [4.92 x 5.00 x 4.80]	4.9 [10.8]
2110	21	21	18	28	54	LDC-011	S7AI13	125 x 127 x 142 [4.92 x 5.00 x 5.59]	6.6 [14.6]
2150	28	28	25.5	36	70	LDC-015	S7AI14	125 x 127 x 152 [4.92 x 5.00 x 5.98]	8 [17.6]
3185	34	34	32	45	90	LDC-022	S7AI15	155 x 160 x 148 [6.10 x 6.30 x 5.83]	8.5 [18.7]
3220	39.5	39.5	35.5	45	90	LDC-022	S7AI15	155 x 160 x 148 [6.10 x 6.30 x 5.83]	8.5 [18.7]
4300 ... 4450	Internal chokes								
ADL5XX - ... - 2T, 3ph									
2055	12	-	-	28	54	LDC-011	S7AI13	125 x 127 x 142 [4.92 x 5.00 x 5.59]	6.6 [14.6]
2075	16	-	-	36	70	LDC-015	S7AI14	125 x 127 x 152 [4.92 x 5.00 x 5.98]	8 [17.6]
3110	21	-	-	45	90	LDC-022	S7AI15	155 x 160 x 148 [6.10 x 6.30 x 5.83]	8.5 [18.7]
4150	Internal chokes								
4185									
4220									

5.2.2 AC input chokes

Size	Effective input current In (@400 V / 50 Hz, with AC input chokes)	Model	Code	Dimensions: Width x Height x Depth	Weight
	[A]			mm [inches]	kg [lbs]
ADL5XX - ... - 4, 3ph					
1040	9	LR3y-2040	S7AAG	120 x 125 x 65 [4.7 x 4.9 x 2.6]	2 [4.4]
1055	13.5	LR3y-2055	S7AB5	120 x 125 x 75 [4.7 x 4.9 x 2.6]	2.2 [4.4]
1075	18	LR3y-2075	S7AB6	150 x 155 x 79 [5.9 x 6.1 x 3.1]	4.9 [10.8]
2110	24	LR3y-3110	S7AB7	150 x 155 x 79 [5.9 x 6.1 x 3.1]	5 [11]
2150	32	LR3y-3150	S7AB8	150 x 169 x 85 [5.9 x 6.7 x 3.3]	5.5 [121]
3185	39	LR3y-3150	S7AB8	150 x 169 x 85 [5.9 x 6.7 x 3.3]	5.5 [12.1]
3220	44,5	LR3-022	S7FF4	180 x 182 x 130 [7.1 x 7.2 x 5.1]	7.8 [17.2]
4300	53	LR3-022	S7FF4	180 x 182 x 130 [7.1 x 7.2 x 5.1]	7.8 [17.2]
4370	70	LR3-037	S7FF2	180 x 160 x 185 [7.1 x 6.3 x 7.3]	9.5 [20.9]
4450	85	LR3-037	S7FF2	180 x 160 x 185 [7.1 x 6.3 x 7.3]	9.5 [20.9]
ADL5XX - ... - 2T, 3ph					
2055	18.2	LR3y-2075	S7AB6	150 x 155 x 79 [5.9 x 6.1 x 3.1]	4.9 [10.8]
2075	25	LR3y-3110	S7AB7	150 x 155 x 79 [5.9 x 6.1 x 3.1]	5 [11]
3110	32.5	LR3y-3150	S7AB8	150 x 169 x 85 [5.9 x 6.7 x 3.3]	5.5 [12.1]
4150	39	LR3y-3150	S7AB8	150 x 169 x 85 [5.9 x 6.7 x 3.3]	5.5 [12.1]
4185	55	LR3-022	S7FF4	180 x 182 x 130 [7.1 x 7.2 x 5.1]	7.8 [17.2]
4220	69	LR3-030	S7FF3	180 x 160 x 185 [7.1 x 6.3 x 7.3]	8.2 [18.1]

(*) 10s every 60s.
Max room operating temperature = 50°C [122°F].

5.3 AC output chokes

The **ADL500** inverter can be used with standard motors or motors designed specifically for use with inverters.
The latter usually have a higher isolation rating to better withstand PWM voltage Examples of reference regulations are provided below: motors designed for use with inverters do not require any specific filtering of output from the inverter.
For standard motors, especially with long cable runs (typically over 100 m) an output choke may be necessary to maintain the voltage waveform with the specified limits.

The range of recommended chokes are listed in the following table. The rated current of the chokes should be approx. 20% higher than that of the inverter in order to take into account additional losses due to modulation of the output waveform.

Size	Model	Code	**Dimensions:** Width x Height x Depth	Weight
			mm [inches]	kg [lbs]
ADL5XX -...- 4, 3ph				
1040	LU3-005	S7FG3	180 x 170 x 110 [7.1 x 6.7 x 4.3]	5.8 [12.8]
1055	LU3-005	S7FG3	180 x 170 x 110 [7.1 x 6.7 x 4.3]	5.8 [12.8]
1075	LU3-005	S7FG3	180 x 170 x 110 [7.1 x 6.7 x 4.3]	5.8 [12.8]
2110	LU3-011	S7FG4	180 x 180 x 130 [7.1 x 7.1 x 5.1]	8 [17.6]
2150	LU3-015	S7FH2	180 x 160 x 170 [7.1 x 6.3 x 6.7]	7.5 [16.5]
3185	LU3-015	S7FH2	180 x 160 x 170 [7.1 x 6.3 x 6.7]	7.5 [16.5]
3220	LU3-022	S7FH3	180 x 160 x 185 [7.1 x 6.3 x 7.3]	8 [17.6]
4300	LU3-030	S7FH4	180 x 160 x 185 [7.1 x 6.7 x 7.3]	10 [22]
4370	LU3-030	S7FH4	180 x 160 x 185 [7.1 x 6.7 x 7.3]	10 [22]
4450	LU3-037	S7FH5	180 x 160 x 185 [7.1 x 6.7 x 7.3]	10 [22]
ADL5XX -...- 2T, 3ph				
2055	LU3-011	S7FG4	180 x 180 x 130 [7.1 x 7.1 x 5.1]	8 [17.6]
2075	LU3-011	S7FG4	180 x 180 x 130 [7.1 x 7.1 x 5.1]	8 [17.6]
3110	LU3-015	S7FH2	180 x 160 x 170 [7.1 x 6.3 x 6.7]	7.5 [16.5]
4150	LU3-022	S7FH3	180 x 160 x 185 [7.1 x 6.3 x 7.3]	8 [17.6]
4185	LU3-030	S7FH4	180 x 160 x 185 [7.1 x 6.7 x 7.3]	10 [22]
4220	LU3-037	S7FH5	180 x 160 x 185 [7.1 x 6.7 x 7.3]	10 [22]
ADL5XX -...- 2M, 1ph				
1011	Please contact the **WEG sales office** for information.			
1015				
2022				
2030				
3040				
3055				

NOTE!

With the inverter operated at the rated current and a frequency of 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage.

5.4 External braking resistors

Recommended combinations for use with internal braking unit.

Size	List and technical data of standard external resistors									
	Resistor type	Code	Q.ty	P_{BR} Braking Power		P_{NBR}	R_{BR}	Housing	Dimensions Width x Height x Depth	Weight
				Duty cycle 10% (*)	Duty cycle 25% (*)					
				[kW]	[kW]	[W]	[Ω]		[mm]	[kg]
Low & Mid Demand Systems - ADL5xx - ... - 4, 3ph										
1040	BRK RES EC 1K5 68R T	S8SZ7	1	6.90	3.84	1500	68	IP20	431 x 135 x 80	2.2
1055	BRK RES EC 1K5 68R T	S8SZ7	1	6.90	3.84	1500	68	IP20	431 x 135 x 80	2.2
1075	BRK RES EC 1K5 49R T	S8SZ8	1	6.90	3.84	1500	49	IP20	431 x 135 x 80	2.2
2110	BRK RES EC 2K 28R T	S8SZ9	1	9.20	5.12	2000	28	IP20	431 x 135 x 80	2.2
2150	BRK RES EC 2K 28R T	S8SZ9	1	9.20	5.12	2000	28	IP20	431 x 135 x 80	2.2
3185	BRK RES EC 4K 15R T	S8SZ18	1	18.40	10.24	4000	15	IP20	431 x 135 x 180	5.0
3220	BRK RES EC 4K 15R T	S8SZ18	1	18.40	10.24	4000	15	IP20	431 x 135 x 180	5.0
4300	BRT4K0-11R6	S8T00H	1	40	150	4000	11.6	IP20	625 x 100 x 250	7.0
4370	BRT4K0-11R6	S8T00H	1	40	150	4000	11.6	IP20	625 x 100 x 250	7.0
4450	BRT8K0-7R7	S8T00I	1	40	150	8000	7.7	IP20	625 x 165 x 250	10.0
Low & Mid Demand Systems - ADL5xx - ... - 2T, 3ph										
2055	BRK RES EC 2K 18R T	S8SZ16	1	9.20	5.12	2000	18	IP20	431 x 135 x 80	2.2
2075	BRK RES EC 2K 18R T	S8SZ16	1	9.20	5.12	2000	18	IP20	431 x 135 x 80	2.2
3110	BRK RES EC 4K 12R T	S8SZ19	1	18.40	10.24	4000	12	IP20	431 x 135 x 180	5.0
4150	BRT4K0-11R6	S8T00H	1	40	150	4000	11.6	IP20	625 x 100 x 250	7.0
4185	BRT4K0-11R6	S8T00H	1	40	150	4000	11.6	IP20	625 x 100 x 250	7.0
4220	BRT8K0-7R7	S8T00I	1	40	150	8000	7.7	IP20	625 x 165 x 250	10.0
Low & Mid Demand Systems - ADL5xx - ... - 2M, 1ph										
1011	BRK RES EC 1K5 68R T	S8SZ7	1	6.90	3.84	1500	68	IP20	431 x 135 x 80	2.2
1015	BRK RES EC 1K5 68R T	S8SZ7	1	6.90	3.84	1500	68	IP20	431 x 135 x 80	2.2
2022	BRK RES EC 1K5 49R T	S8SZ8	1	6.90	3.84	1500	49	IP20	431 x 135 x 80	2.2
2030	BRK RES EC 2K 28R T	S8SZ9	1	9.20	5.12	2000	28	IP20	431 x 135 x 80	2.2
3040	BRK RES EC 2K 15R T	S8SZ18	1	18.40	10.24	4000	15	IP20	431 x 135 x 180	5.0
3055	BRK RES EC 2K 15R T	S8SZ18	1	18.40	10.24	4000	15	IP20	431 x 135 x 180	5.0
High Demand Systems - ADL5xx - ... - 4, 3ph										
1040	BRK RES EC 3K 68R T	S8SZ10	1	13.80	7.68	3000	68	IP20	431 x 135 x 180	5.0
1055	BRK RES EC 3K 68R T	S8SZ10	1	13.80	7.68	3000	68	IP20	431 x 135 x 180	5.0
1075	BRK RES EC 4K 49R T	S8SZ11	1	18.40	10.24	4000	49	IP20	431 x 135 x 180	5.0
2110	BRK RES EC 5K 28R T	S8SZ12	1	23.00	12.80	5000	28	IP20	431 x 135 x 266	7.5
2150	BRK RES EC 8K 28R T	S8SZ13	1	36.80	20.48	8000	28	IP20	431 x 135 x 352	10.0
3185	BRK RES EC 12K 15R T	S8SZ21	1	55.20	30.72	12000	15	IP20	431 x 135 x 535	15.0
3220	BRK RES EC 12K 15R T	S8SZ21	1	55.20	30.72	12000	15	IP20	431 x 135 x 535	15.0
4300	BDRT 16K1 10R	S799974	1	64	20	16000	10	IP20	610 x 300 x 450	25.0
4370	BDRT 16K1 10R	S799974	1	64	20	16000	10	IP20	610 x 300 x 450	25.0
4450	BDR 24K1 7R5	S799962	1	96	30	24000	7.5	IP20	610 x 540 x 450	40.0
High Demand Systems - ADL5xx - ... - 2T, 3ph										
2055	BRK RES EC 4K 18R T	S8SZ17	1	18.40	10.24	4000	18	IP20	431 x 135 x 180	5.0
2075	BRK RES EC 4K 18R T	S8SZ17	1	18.40	10.24	4000	18	IP20	431 x 135 x 180	5.0
3110	BRK RES EC 6K 12R T	S8SZ20	1	27.60	15.36	6000	12	IP20	431 x 135 x 266	7.5
4150	BRK RES EC 4K 15R T	S8SZ18	2	36.8	20.48	8000	7.5	IP20	431 x 135 x 180	5.0
4185	BRK RES EC 4K 15R T	S8SZ18	2	36.8	20.48	8000	7.5	IP20	431 x 135 x 180	5.0
4220	BRT 4K0-11R6	S8T00H	2	32.0	10.0	8000	5.8	IP20	625 x 100 x 250	7.0

P_{NBR} Braking resistor rated power - **R_{BR}** Braking resistor ohmic value (*) - Max cycle period = 120s

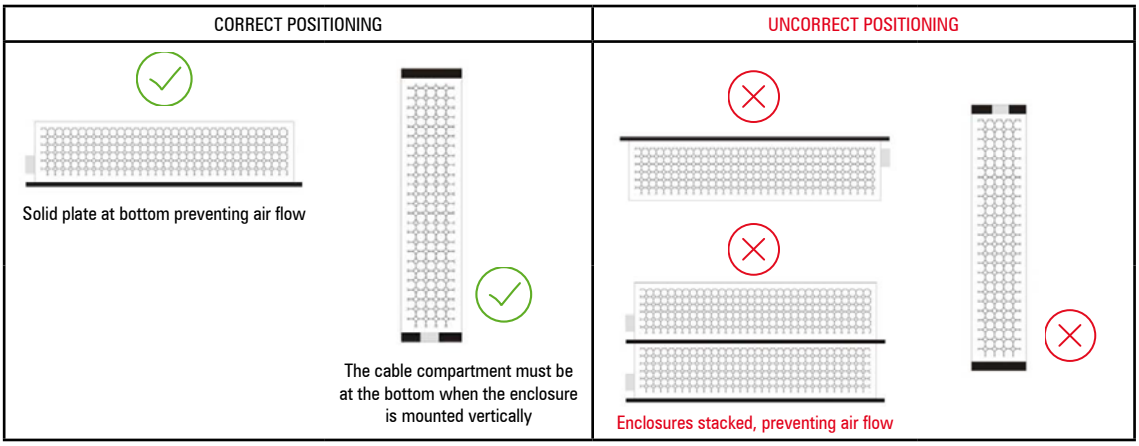
WARNING!

With the inverter operated at the rated current and a frequency of 50 Hz, the output chokes cause a voltage drop of approx. 2% of the output voltage.
Braking resistors may be subject to unexpected overloads due to faults. Resistors MUST be protected using thermal cutouts.
These devices must not interrupt the circuit in which the resistor is inserted but their auxiliary contact must cut off the power supply to the power section of the drive. If the resistor requires a protection contact, this must be used together with that of the thermal cutout.

CAUTION!

Braking resistors positioning requirements

The enclosure must be mounted on a flat surface, ideally horizontally with the solid plate at base.



5.5 EMC Filter

The **ADL-...-F** models are standard equipped with an internal EMC filter to ensure compliance with the EN 12015 standard.

Shielded motor power cables with a maximum length of 10 m must be used and the shielding must be grounded at both ends.

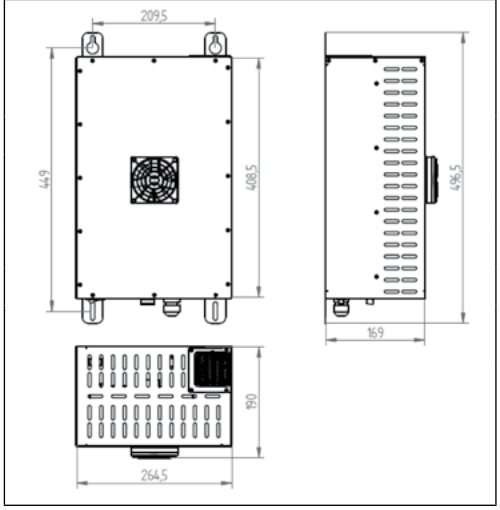
5.6 Ultracapacitor energy storage module

The **ADL500** inverter can be connected to energy recovery systems with ultra-capacitor modules.
These modules store the energy lost by the lift during the motor braking stage and return it on the next travel, thus saving energy (the closer together the trips, the greater the savings) without harmonic distortion and no additional stand-by consumption.

The system recommended by **WEG** is a high-efficiency bidirectional DC/DC converter that integrates the ultra-capacitor energy storage module and connects it to the ADL500 inverter with a simple, two-wire connection.

Features	Values
Voltage range of the DC connection to the frequency inverter	500 ... 800 V
Maximum current through DC connection to the inverter	12.4 A
Maximum power	6.3 kW
Unidirectional efficiency	≤98%
Operating temperature	5 ... 40ºC
Weight	13 kg
IP Protection degree	IP2X
Minimum installation clearance top and bottom	> 250 mm
Directives	Low Voltage Directive (2014/35/UE): EN 50178:1998 Electromagnetic Compatibility Directive (2014/30/UE): EN 12015:2014, EN 12016:2014

Dimensions [mm]



Additional technical specifications are available from the catalogue of the manufacturer: Epic Power Converters S.L.®.

Recommended combination:

Sizes ADL5XX -...- 4, 3ph	Energy Recovery System module		Maximum cable cross-section (flexible conductor)	
	Model	Q.ty	[mm²]	[AWG]
1040	ERS 2G	1	4	10
1055	ERS 2G	1	4	10
1075	ERS 2G	1	4	10
2110	ERS 2G	1	16	6
2150	ERS 2G	1	16	6

The ERS 2G® module is connected in parallel with the DC-Link, downstream of the drive's precharge resistor, directly to the DC-Link capacitors via terminals BR1 (+) and D (-).
The ERS 2G® module DOES NOT REPLACE the braking resistor, this part remains mandatory.
Operation requires an enable signal, otherwise the module remains in stand-by and does not store or return energy to the drive.

WARNING!

Install as indicated in the module manufacturer's installation manual, paying particular attention to the procedure and safety recommendations.

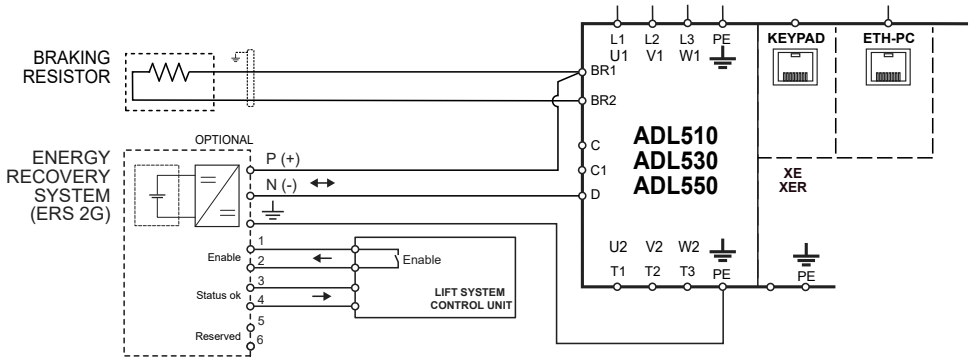


Figure 5.6.1: Connection for energy storage module ERS 2G

5.7 Emergency floor return battery (ADL5XX-EMS)

Only for ADL510/530/550-...-EMS models (with integrated Emergency Mode Supply module).

In the event of a failure of the main power supply, the optional external battery pack powers the EMS circuit of **ADL5XX-EMS** drives so the cabin can return to the floor.
Under such emergency conditions, the lift can move for a short travel (i.e. to reach the next floor).

The connection diagram is described in **"Figure 7.9.5: Emergency connection diagram with EMS module"**.

Specifications

Battery voltage _____ 48V_{DC} ...96V_{DC} (120V_{DC} considering an upper limit tolerance of 25%)
Rated battery current _____ equal to rated inverter current
Battery protection _____ the EMS circuit has an internal diode that protects the battery from the high DC LINK voltage.

Battery connection

Battery terminals	ADL5XX-EMS terminals	Cable section
+	EM	See section "**7.2.1 - Power terminals and connection**"
-	D	

Operating description

When the main input power supply fails, if the battery is connected and provides a voltage greater than 48 Vdc, the DC/DC converter is switched on (including the regulation board and all auxiliary circuitry for the gate drive, thermal sense, current feedback, etc.) and the microprocessor receives the **"BATTERY_ON"** (battery connected) signal.
This signal does not provide any information about the battery charge.
If emergency input is not activated (dedicated digital input, PAR 11242), the precharge relay remains open because the DC link is below the minimum voltage threshold; no alarm is signalled until PWM is enabled.
Before enabling the emergency input, the main contactor K1M must open (to prevent unexpected reset of the main power supply which could damage the drive). A delay must be arranged to consider contactor K1M opening time before any further action can be taken (e.g. by providing an interlock between the main contactor and the emergency contactor KE so that the latter can only be enabled if K1M has opened).
Under normal and emergency operations, the KE contactor can remain closed and only be opened to switch off the system, thus saving the batteries after the emergency operation is completed.
To enable motor movement, the digital input must be activated to emergency mode (previously set through parameter 11242).
After selecting the emergency state, the undervoltage condition is eliminated and the precharge relay is closed. The unit is ready to operate and the lift can move to the evacuation floor.
After the lift has completed its travel (PWM OFF) and the external brake has been disabled (PAR 11242), emergency input must be disabled. Disabling the emergency input opens the precharge relay in about 200 ms and only afterwards the K1M contactor can be closed. Therefore, a minimum delay of 200 ms is mandatory from disabling the emergency digital input to connection of the main power supply to the contactor K1M.
When power is restored, the precharge relay is closed, the DC/DC converter is switched on and the drive is ready.
Under such conditions, the drive and lift system can operate normally.
The main power supply may be reinstated during the emergency trip: this will not damage the drive as the main contactor K1M must be kept open until the emergency trip has been terminated.

NOTE!

The battery can always be connected to the drive (KE always closed).
Arrange for external battery charge monitoring and for an external charger; under this condition, the battery will supply a small amount of power to the drive.
An alternative is to close the KE only when emergency mode is selected. In any case, battery monitoring and charger must be supplied externally.

Emergency operation and connection diagram

See section **"7.10 - Emergency and plan replenishment in the event of a blackout"**.

5.8 Emergency battery and Vdc power supply of the drive for return to floor (ADL5XX-UB)

As in the case of a drive fitted with an EMS module, the motor is re-powered in the event of a blackout via the battery pack (connected between inputs C and D) but, unlike the version with an EMS module, the presence of the battery pack and its efficiency is checked by the control panel manufacturer. The drive will need an auxiliary power supply of 270 V ±10% to be applied:

- between AUX+ (+) and D (-) input for size 1 and 2;
- between AUX+ (+) and AUX- (-) input for size 3;
- size 4 AUX+ (+) and D (-).

For all the rest, the same considerations apply as for the model with **EMS module**.

6 - Mechanical installation

CAUTION!

The Drive must be mounted on a wall that is constructed of heat resistant material. While the Drive is operating, the temperature of the Drive's cooling fins can rise to a temperature of 158° F (70°C).

Because the ambient temperature greatly affects Drive life and reliability, do not install the Drive in any location that exceeds the allowable temperature.

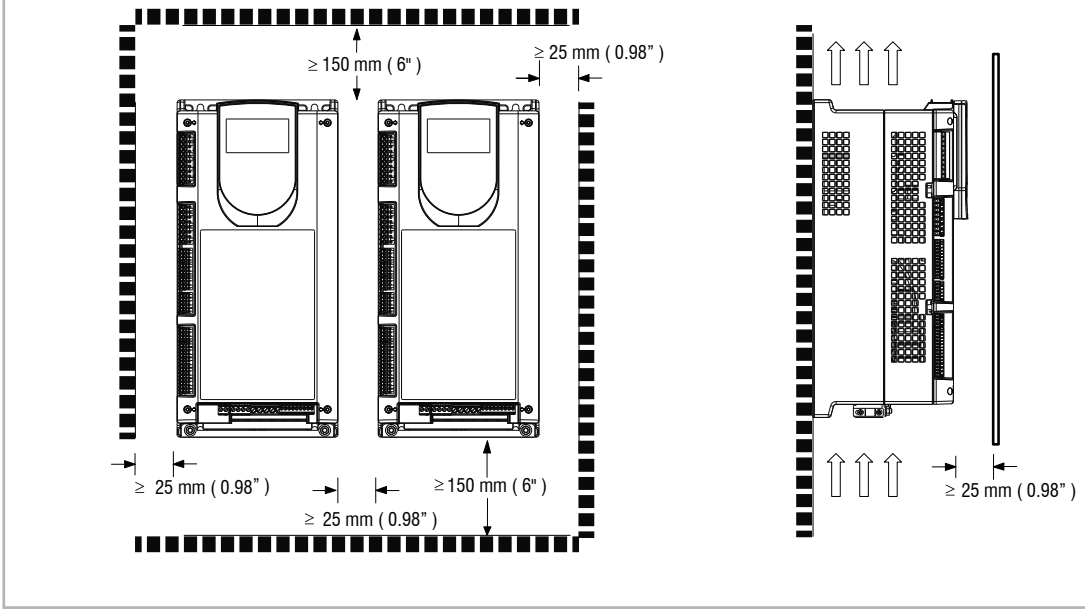
Be sure to remove the desicant dryer packet(s) when unpacking the Drive. (If not removed these packets may become lodged in the fan or air passages and cause the Drive to overheat).

Protect the device from impermissible environmental conditions (temperature, humidity, shock, etc.)

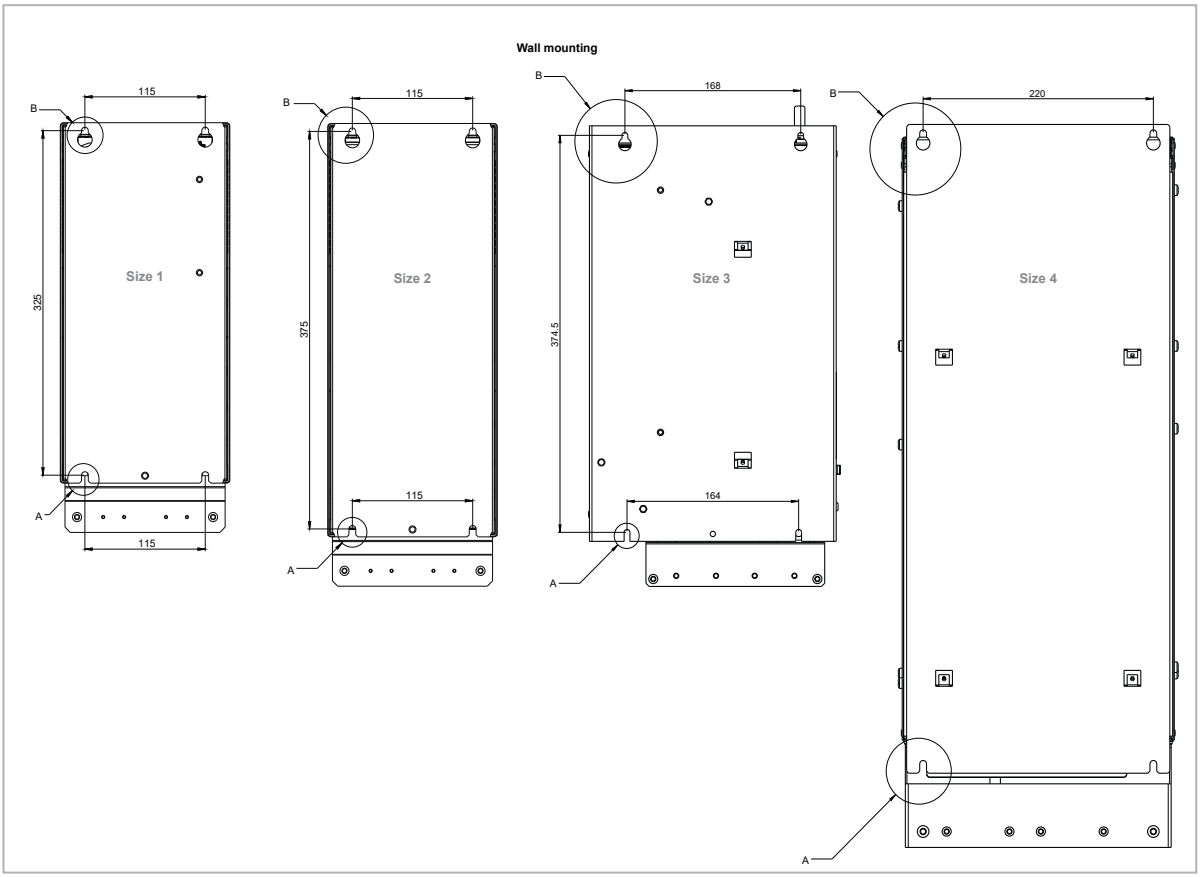
6.1 Maximum inclination and assembly clearances

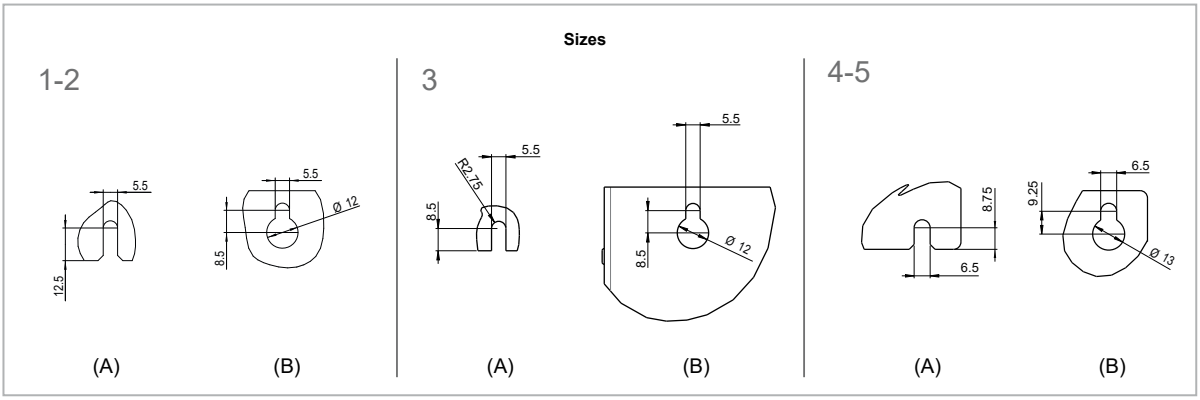
The inverters must be mounted in such a way that air can flow freely around them, see section **"4.9 - Cooling"**.

Maximum angle of inclination	30° (referred to vertical position)
Minimum top and bottom distance	150 mm
Minimum free space to the front	25 mm
Minimum distance between drives	25 mm
Minimum distance to the side with the cabinet	25 mm



6.2 Fastening position





	Recommended screws for fastening
Size 1 (ADL5XX-1...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer
Size 2 (ADL5XX-2...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer
Size 3 (ADL5XX-3...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer
Size 4 (ADL5XX-4...)	4 x M5 x 12 mm screws + Grover (spring-lock) washer + flat washer

NOTE! Other dimensions see section "**4.10 - Weights and dimensions**".

7 - Wiring Procedure

CAUTION!

The equipment is intended for installation in accordance with the Canadian Electrical Code, Part I (CSA C22.1) and the National Electrical Code (ANSI/NFPA 70), whichever is applicable.

The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations.

CAUTION!

Operation with Residual Current Device (Differential switch)

When a residual current device (RCD) is used for protection against electric shock sure that follow condiction are respected:

- only a type B RCD is allowed on the supply side of this product;
- all upstream RCDs, up to the power transformer, must be type B;
- this device must have a high leakage current (≥ 300 mA);
- the neutral of the supply is grounded (TT or TN systems);
- only one inverter is supplied from each RCD;
- the output cables are less than 50 m (screened) or 100 m (unscreened).

Acronyms used:

RCD: Residual Current Device

RCCB: Residual Current Circuit Breaker

ELCB: Earth Leakage Circuit Breaker

NOTE!

The residual current operated circuit-breakers used must provide protection against direct-current components in the fault current and must be suitable for briefly suppressing power pulse current peaks. It is recommended to protect the frequency inverter by fuse separately.

The regulations of the individual country and the regional power suppliers must be observed!

CAUTION!

Adjustable frequency ADL500 drives are electrical apparatus for use in for civil lifting installations.

Parts of the Drives are energized during operation. The electrical installation and the opening of the device should therefore only be carried out by qualified personnel.

Improper installation of motors or Drives may therefore cause the failure of the device as well as serious injury to persons or material damage.

Drive is not equipped with motor overspeed protection logic other than that controlled by software. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

Replace all covers before applying power to the Drive. Failure to do so may result in death or serious injury.

CAUTION!

The drive must always be grounded. If the drive is not connected correctly to ground, extremely hazardous conditions may be generated that may result in death or serious injury.

Never open the device or covers while the AC Input power supply is switched on. Minimum time to wait before working on the terminals or inside the device is listed in section "4.7 Voltage level of the inverter for safe operations".

Do not touch or damage any components when handling the device. The changing of the isolation gaps or the removing of the isolation and covers is not permissible.

CAUTION!

Do not connect power supply voltage that exceeds the standard specification voltage fluctuation permissible. If excessive voltage is applied to the Drive, damage to the internal components will result.

CAUTION!

Functioning of the Drive without a ground connection is not permitted. To avoid disturbances, the armature of the motor must be grounded using a separate ground connector from those of other appliances.

The grounding connector shall be sized in accordance with regulations and national electrical codes (NEC) of reference. For applications according to North American standards, the connection shall be made by a UL listed or CSA certified closed-loop terminal connector sized for the wire gauge involved. The connector is to be fixed using the crimp tool specified by the connector manufacturer.

Do not perform a megger test between the Drive terminals or on the control circuit terminals.

No voltage should be connected to the output of the drive (terminals U2, V2 W2). The parallel connection of several drives via the outputs and the direct connection of the inputs and outputs (bypass) are not permissible.

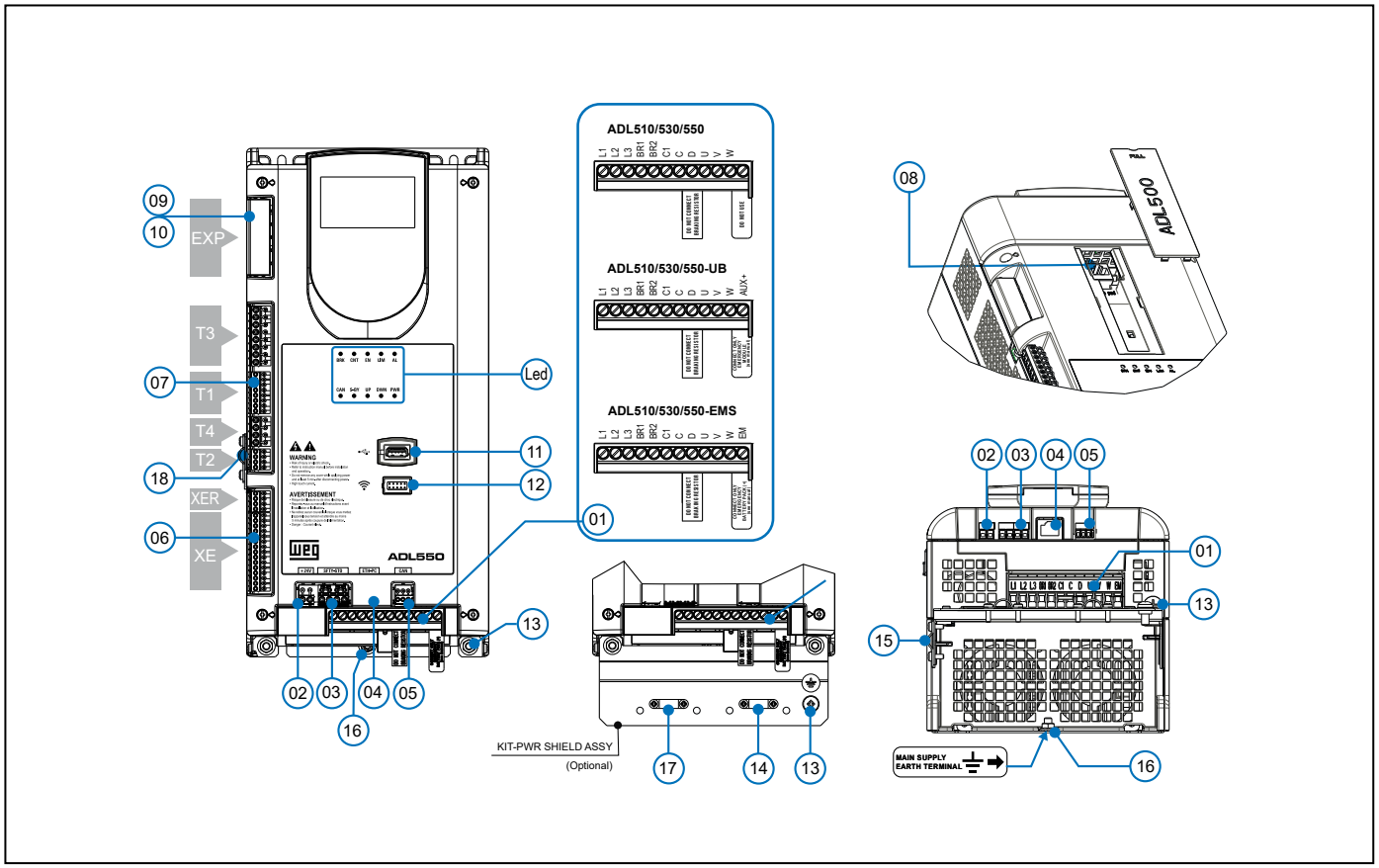
The electrical commissioning should only be carried out by qualified personnel, who are also responsible for the provision of a suitable ground connection and a protected power supply feeder in accordance with the local and national regulations. The motor must be protected against overloads.

The storage of the Drive for more than two years could damage the operating capacity of the DC link capacitors, which must therefore be "restored".

Before the commissioning of devices left in storage for such a long period, we recommend a power supply of at least two hours without load in order to regenerate the capacitors (the input voltage must be applied without enabling the Drive).

7.1 Location and identification of terminals and LEDs

Sizes 1 and 2:



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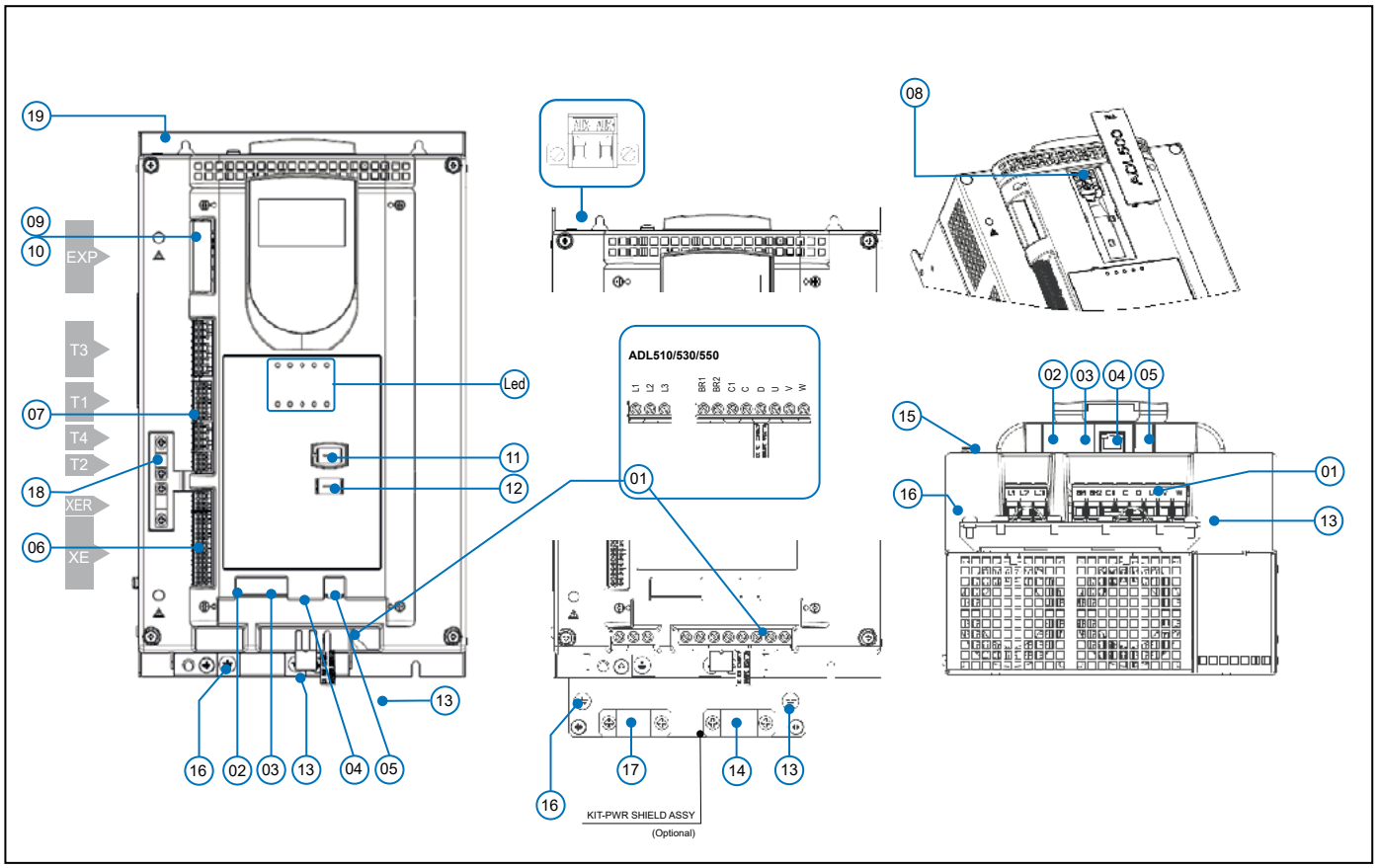

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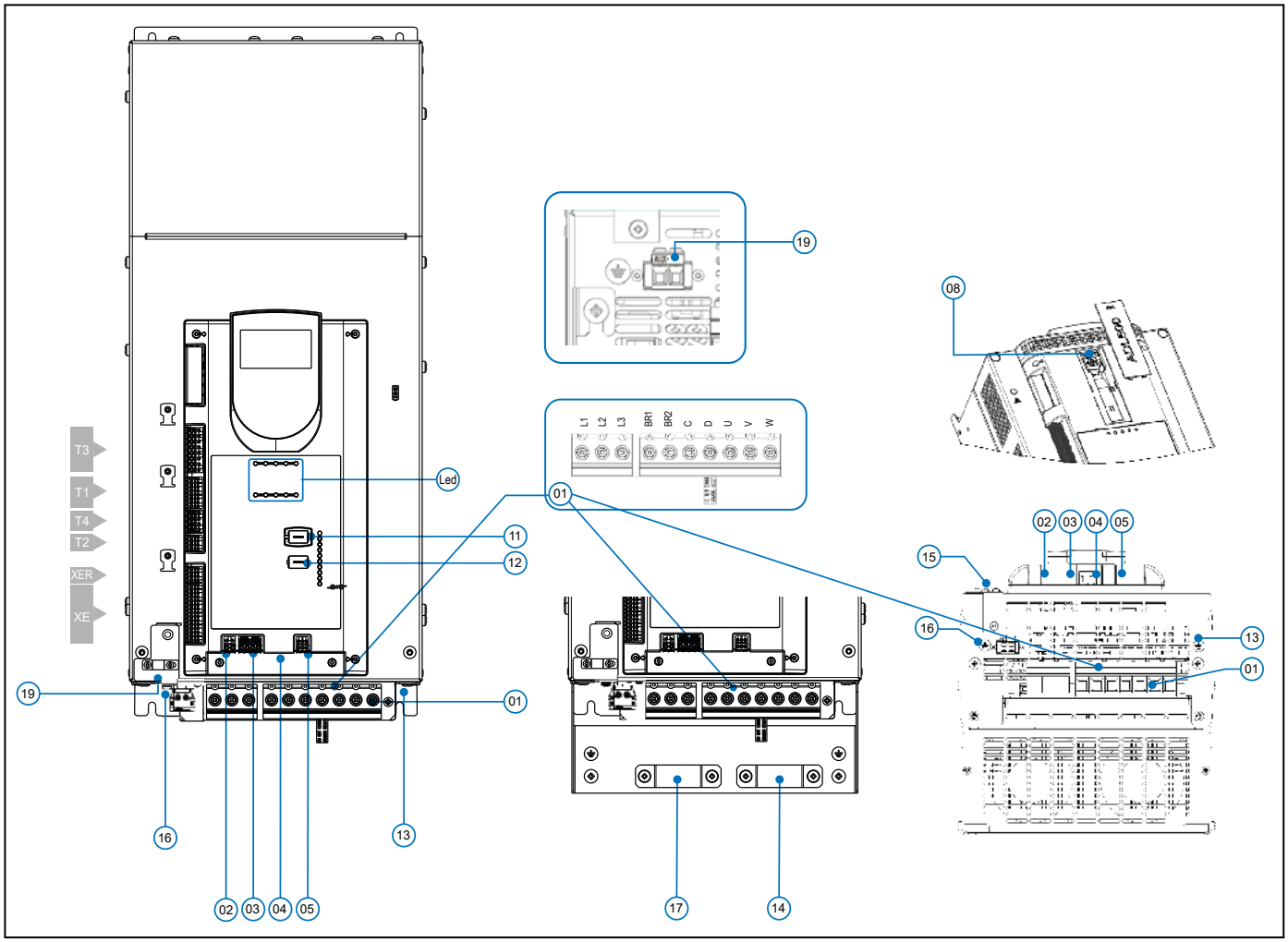


Ref.		Description	ADL510	ADL530	ADL550	Manual section
(01)		Power terminals	Yes	Yes	Yes	**"7.2 - Power section"**
(02)	**+24V**	Input + 24 Vdc external	-	-	Yes	**"7.3.4 -+24V supply connection"**
(03)	**SFTY-STO**	STO Safety terminals	-	-	Yes	**"7.3.5 - Safety STO connection"**
(04)	**ETH-PC**	RJ45 terminal, Ethernet port (100 Mbit/s)	Yes	Yes	Yes	**"7.4 - ETH-PC Ethernet Interface"**
(05)	**CAN**	CANopen 417 Lift terminals	-	Yes	Yes	**"7.5 - CAN interface"**
(06)	**XE/XER**	Encoder terminals	Yes	Yes	Yes	**"7.3.3 - Feedback Connection"**
(07)	**T1**	Digital input terminal	Yes	Yes	Yes	**"7.3.2 - I/O and Relays connection"**
	T2	Analog input terminal				
	T3	Relay output terminal				
	T4	Digital and +24V input enable / reference terminal				
(08)		RJ45 terminal, KB-ADL500 optional keypad	Yes	Yes	Yes	**"7.6 - Optional Keypad interface"**
(09)	**EXP**	Optional EXP-IO1-ADL500 card terminals	-	-	Yes	**"A.1.2 - Optional card EXP-IO1-ADL500"**
(10)		Optional EXP-DCP-ADL500 card terminals	-	-	Yes	**"A.1.3 - Optional card EXP-DCP-ADL500"**
(11)	⇤	USB 2.0 port	-	Yes	Yes	**"7.7 - USB port for data storage"**
(12)	ᯤ	Wi-Fi Port	-	Yes	Yes	**"7.8 - Wi-Fi module port"**
(13)	⏚	Motor Earth terminals	Yes	Yes	Yes	**"7.2 - Power section"**
(14)		Omega motor cable shield connection	Yes	Yes	Yes	**"7.2.3 - Connection of shielding"**
(15)		Omega feedback cable shield connection	Yes	Yes	Yes	**"7.3.3 - Feedback Connection"**
(16)	⏚	Mains supply earth terminals	Yes	Yes	Yes	**"7.2 - Power section"**
(17)		Securing of Omega power cable	Yes	Yes	Yes	**"7.2.1 - Power terminals and connection"**

(18)		Omega connection for shielding of terminal T2	Yes	Yes	Yes	**"7.3.2 - I/O and Relays connection"**
(19)		Emergency power supply AUX+ AUX-	Yes	Yes	Yes	**"7.2.3 - Connection of shielding"**
Led		Operation and diagnostics LEDs	Yes	Yes	Yes	**"7.3.6 - LEDs"**

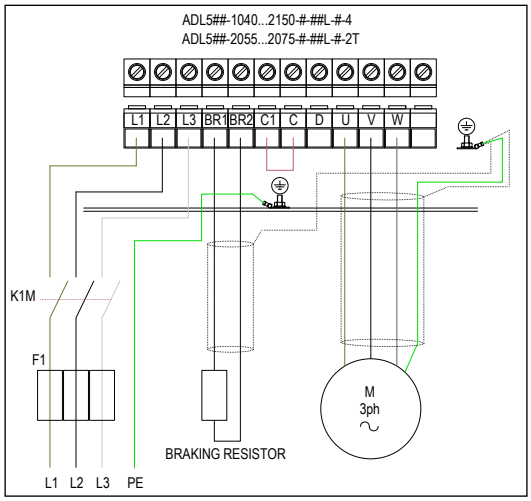
7.2 Power section

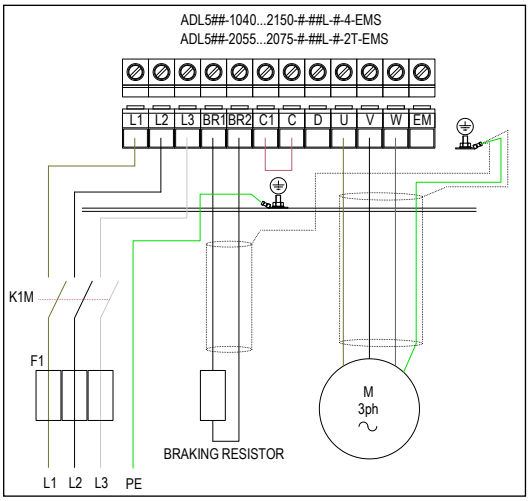
NOTE! For the position of the terminals see section "7.1 Location and identification of terminals and LEDs".

7.2.1 Power terminals and connection

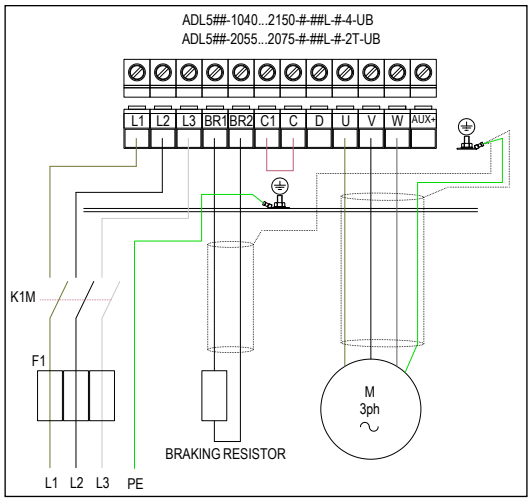
Terminal	Description	IN/ OUT	ADL510/530/550	ADL510/530/550 EMS	ADL510/530/550 UB
L1/L	Three-phase main supply, phase L1; mono-phase main supply phase L	IN	Yes	Yes	Yes
L2/N	Three-phase main supply, phase L2; mono-phase main supply phase N	IN	Yes	Yes	Yes
L3	Three-phase main supply, phase L3	IN	Yes	Yes	Yes
BR1	Braking resistor input	IN	Yes	Yes	Yes
BR2	Braking resistor output	OUT	Yes	Yes	Yes
C1	DC inductance (if not used, insert jumper with terminal C) DC Link (+)	OUT	Yes	Yes	Yes
C	DC inductance (*)	IN	Yes	Yes	Yes
D	DC Link (-) (*)	IN	Yes	Yes	Yes
U	Motor connection, phase U	OUT	Yes	Yes	Yes
V	Motor connection, phase V	OUT	Yes	Yes	Yes
W	Motor connection, phase W	OUT	Yes	Yes	Yes
EM	Battery main supply (+)	IN	-	Yes	-
AUX +	Auxiliary power supply of the drive power circuit 270 Vdc ±10%	IN	-	-	Yes
AUX -	Auxiliary power supply of the drive power circuit	IN	-	-	Yes (only size 3, for size 4 it's D terminal on power connector)

(*) C and D are used also for emergency power supply Vdc. refer to section **"7.10 - Emergency and plan replenishment in the event of a blackout"**.

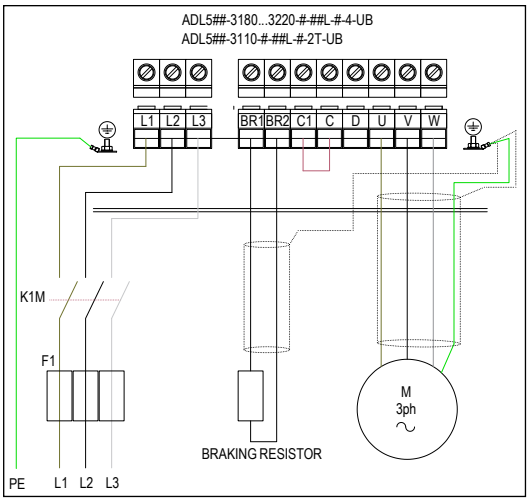




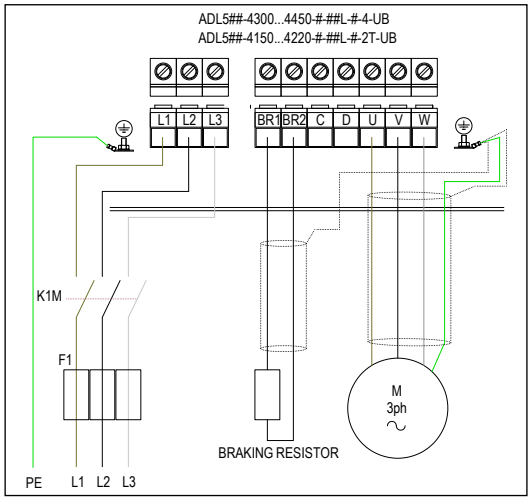
ADL5##-1040...2150-#-##L-#-4-UB
ADL5##-2055...2075-#-##L-#-2T-UB



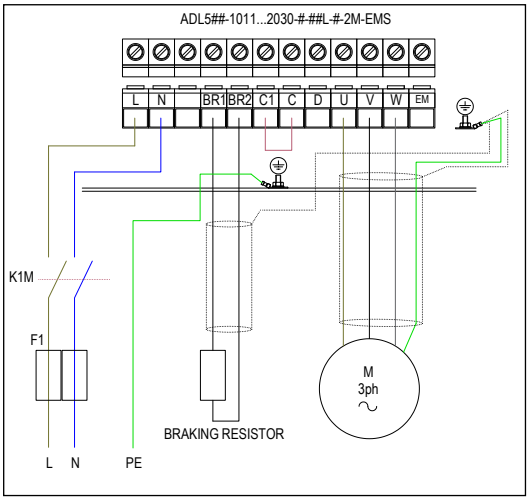
ADL5##-3180...3220-#-##L-#-4-UB
ADL5##-3110-#-##L-#-2T-UB



ADL5##-4300...4450-#-##L-#-4-UB
ADL5##-4150...4220-#-##L-#-2T-UB



ADL5##-1011...2030-#-##L-#-2M-EMS



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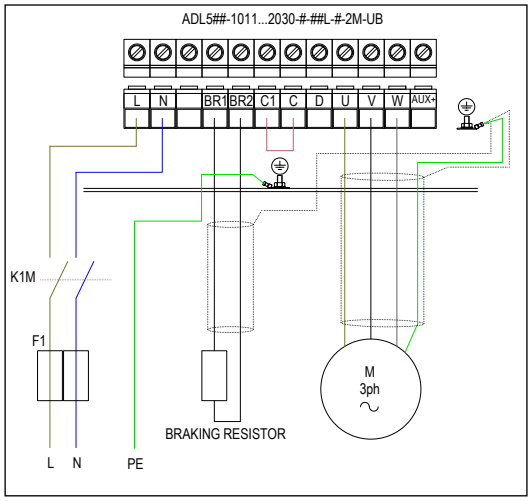
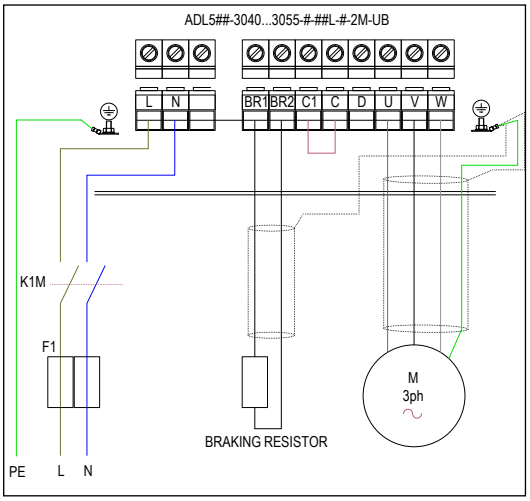


ADL5##-3040...3055-#-##L-#-2M-UB



7.2.2 Cable cross-sections

Sizes	-4, 3 ph | Terminals: L1 - L2 - L3 - BR1 - BR2 - C1 - C - D - U - V - W - EM				
	Maximum cable cross-section (flexible conductor)		Recommended stripping	Recommended terminal	Tightening torque (min)
	[mm²]	[AWG]	[mm]	[mm]	[Nm]
1040	4	10	8	None / pin	0.5 ... 0.6
1055	4	10	8	None / pin	0.5 ... 0.6
1075	4	10	8	None / pin	0.5 ... 0.6
2110	16	6	10	None / pin	1.2 ... 1.5
2150	16	6	10	None / pin	1.2 ... 1.5
3185	16	6	14	None / pin	1.2 ... 1.38
3220	16	6	14	None / pin	1.2 ... 1.38
4300	35	2	18	None / pin	2.4 ... 4.5
4370	35	2	18	None / pin	2.4 ... 4.5
4450	35	2	18	None / pin	2.4 ... 4.5

Sizes	-2T, 3 ph | Terminals: L1 - L2 - L3 - BR1 - BR2 - C1 - C - D - U - V - W - EM				
	Maximum cable cross-section (flexible conductor)		Recommended stripping	Recommended terminal	Tightening torque (min)
	[mm²]	[AWG]	[mm]	[mm]	[Nm]
2055	16	6	10	None / pin	1.2 ... 1.5
2075	16	6	10	None / pin	1.2 ... 1.5
3110	16	6	14	None / pin	1.2 ... 1.38
4150	35	2	18	None / pin	2.4 ... 4.5
4185	35	2	18	None / pin	2.4 ... 4.5
4220	35	2	18	None / pin	2.4 ... 4.5

Sizes	-2M, 1 ph | Terminals: L - N - BR1 - BR2 - C1 - C - D - U - V - W - EM				
	Maximum cable cross-section (flexible conductor)		Recommended stripping	Recommended terminal	Tightening torque (min)
	[mm²]	[AWG]	[mm]	[mm]	[Nm]
1011	4	10	8	None / pin	0.5 ... 0.6
1015	4	10	8	None / pin	0.5 ... 0.6
2022	16	6	10	None / pin	1.2 ... 1.5
2030	16	6	10	None / pin	1.2 ... 1.5
3040	16	6	14	None / pin	1.2 ... 1.38
3055	16	6	14	None / pin	1.2 ... 1.38

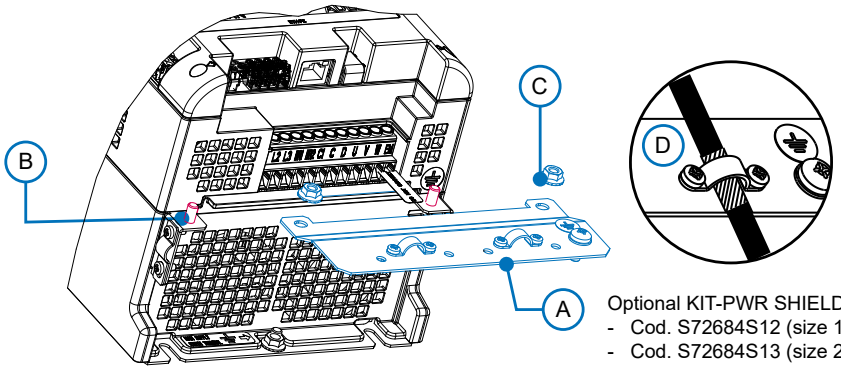
Sizes	Terminals: ⏚ on structural work (see ref. (16) on previous page)				
	Cable cross-section		Lock screw diameter	Recommended terminal	Tightening torque (min)
	[mm²]	[AWG]	[mm]	[mm]	[Nm]
1040 ... 4450	Same as the maximum cross-section used for the power terminal strip		M5	Eyelet - Fork	6

NOTE!

The minimum cross-section for both ground connections must comply with EN61800-5-1 prescriptions. Always ground both points on structural steel.

7.2.3 Connection of shielding (recommended)

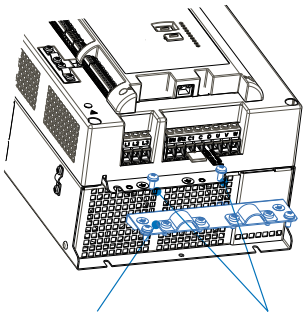
Size 1 - 2



Optional KIT-PWR SHIELD ASSY:
- Cod. S72684S12 (size 1)
- Cod. S72684S13 (size 2)

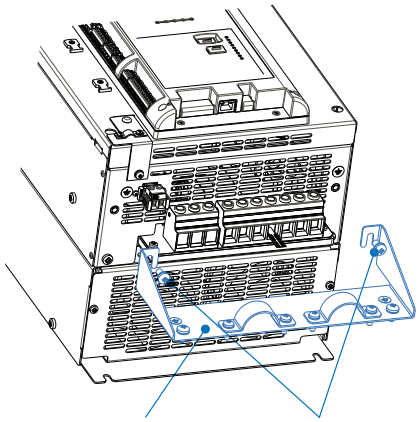
For compliance with EN 12016: put the optional metal support KIT-PWR SHIELD ASSY (A) on bolts (B) and tighten the two nuts fully (C). Fasten the power cable shield to the omega sections (D).

Size 3



Optional KIT-PWR SHIELD ASSY: Cod. S730143 (size 3)
2 screws

Size 4



Optional KIT-PWR SHIELD ASSY: Cod. S72902 (size 4)
2 screws

7.2.4 EMC guide line

WARNING!

In a domestic environment, this product may cause radio inference, in which case supplementary mitigation measures may be required.

ATTENTION!

The converters are protected in order to be used in industrial environments where, for immunity purposes, large amounts of electromagnetic interference can occur. Proper installation practices will ensure safe and trouble-free operation.

If you encounter problems, follow the guidelines which follow.

- Check for all equipment in the cabinet are well grounded using short, thick grounding cable connected to a common star point or busbar. Better solution is to use a conductive mounting plane and use that as EMC ground reference plane.
- Flat conductors, for EMC grounding, are better than other type because they have lower impedance at higher frequencies.
- Make sure that any control equipment (such as a PLC) connected to the inverter is connected to the same EMC ground or star point as the inverter via a short thick link.
- Connect the return ground from the motors controlled by the drives directly to the ground connection (⏚) on the associated inverter.
- Separate the control cables from the power cables as much as possible, using separate trunking, if necessary at 90° to each other.
- Whenever possible, use screened leads for the connections to the control circuitry
- Ensure that the contactors in the cubicle are suppressed, either with R-C suppressors for AC contactors or 'flywheel' diodes for DC contactors fitted to the coils. Varistor suppressors are also effective. This is important when the contactors are controlled from the inverter relay.
- Use screened or armored cables for the motor connections and ground the screen at both ends using the cable clamps.
- Use power shield kit to connect shield of motor cable to drive.

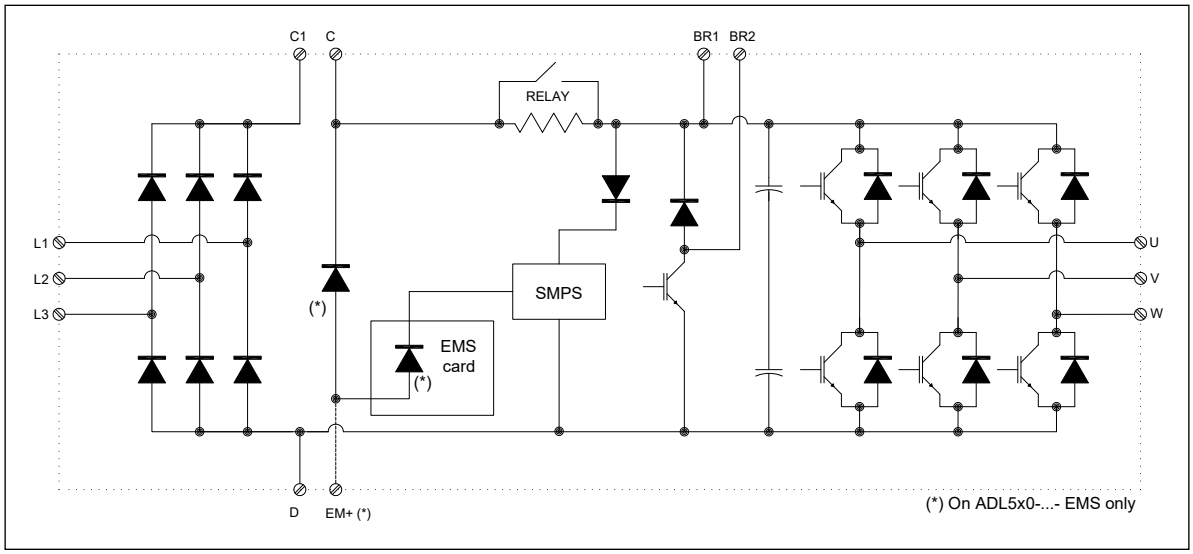
NOTE!

For further information regarding electro-magnetic compatibility standards, according to Directive 2014/30/EU, conformity checks carried out on WEG appliances, connection of filters and mains inductors, shielding of cables, ground connections, etc., consult the “Electro-magnetic compatibility guide” (1S5E84) you can download from www.weg.net.

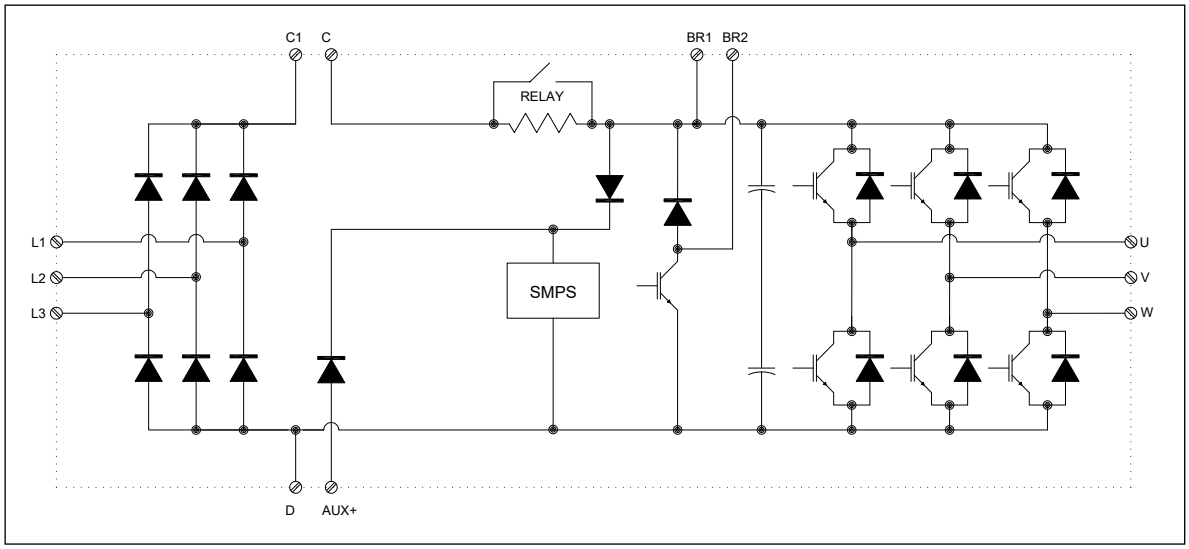
7.2.5 Block diagram of power section

This type is equipped with an EMI input filter (models **ADL5XX-...-F-..**), an AC/DC converter, a system for pre-loading DC capacitors, a DC/AC converter, a power supply unit and an integrated braking unit.
A specific external resistor must be connected to perform the braking function between terminals BR1 and BR2.
An optional external BUy braking unit can be used and connected to terminals C and D. Refer to the BUy handbook for further information.
To manage emergency situations (drive power failure) the unit also envisages ordering the option with an emergency module inside the drive (ADL5XX-...-EMS models) and powering the emergency unit between terminals EM and D with a battery.

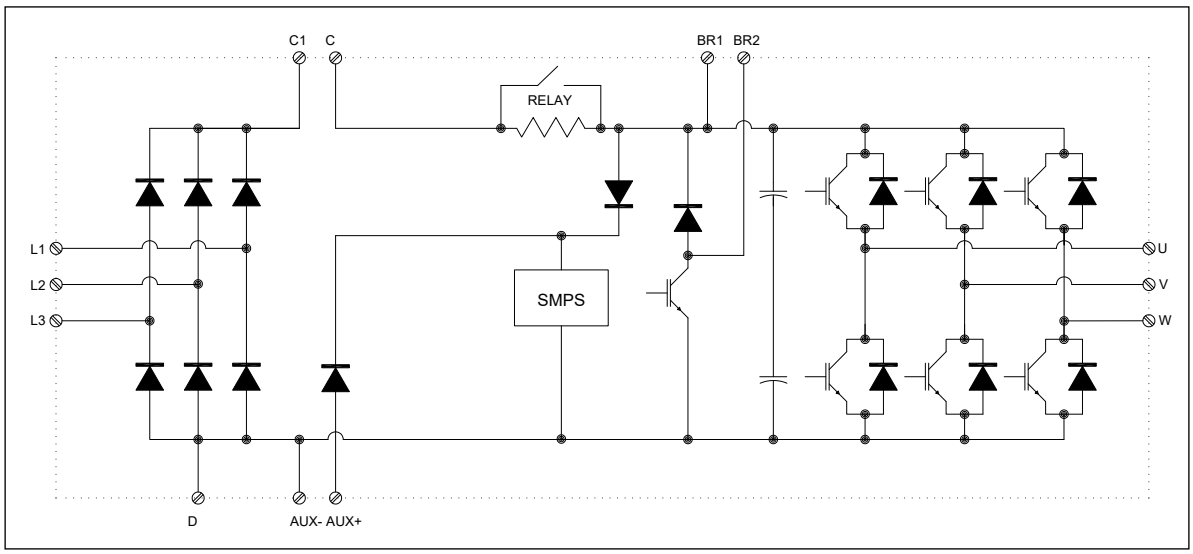
Size 1 and 2



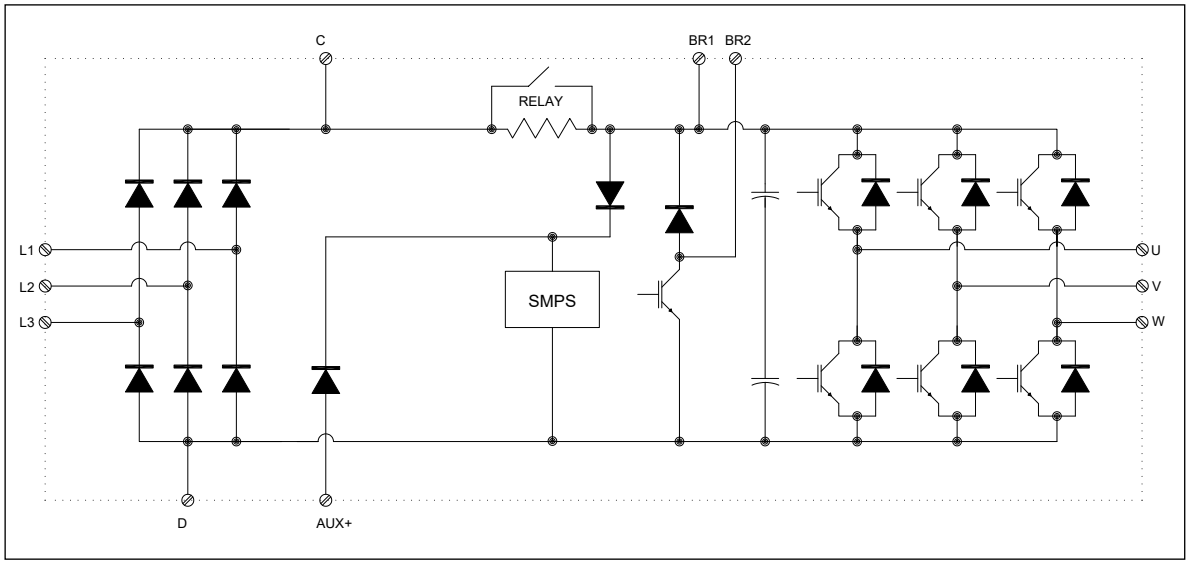
Size 1 and 2 UB



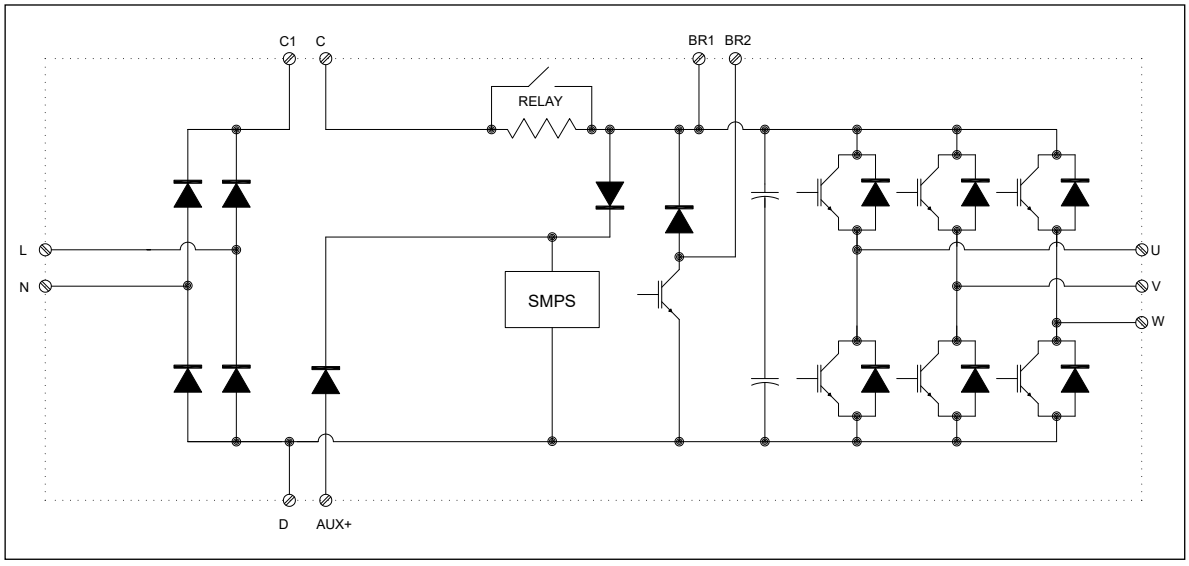
Size 3 UB



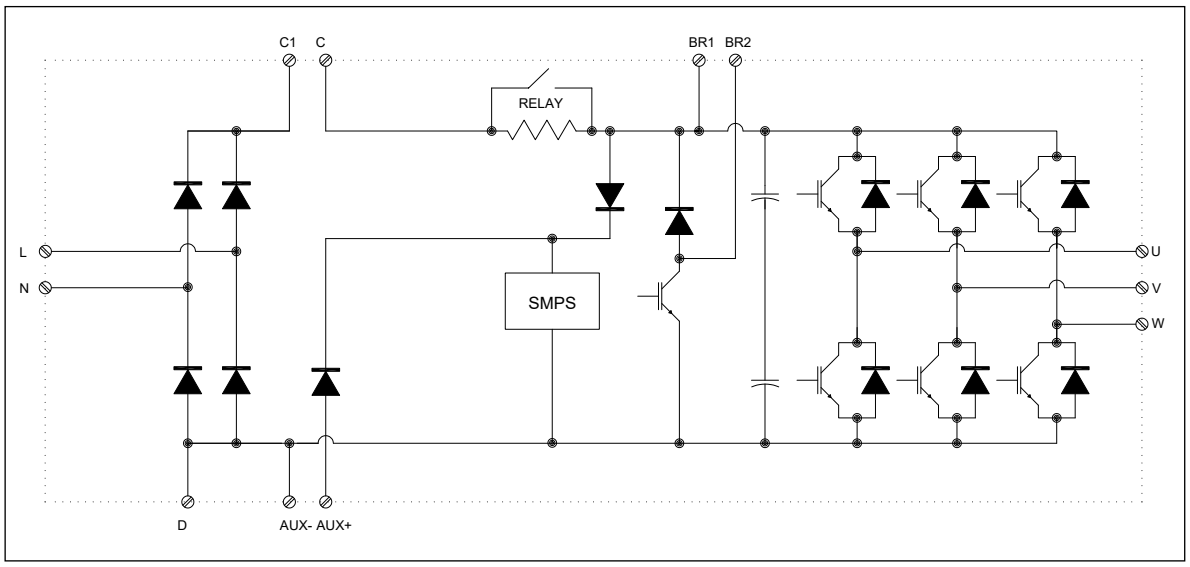
Size 4 UB



Size 1 and 2 UB 1ph



Size 3 UB 1ph



7.2.6 Internal EMC filter (standard)

The **ADL510/530/550-...-F-..** series of inverters are equipped with an internal EMI filter able to guarantee the performance levels required by EN 12015, first environment, with max 10 m of shielded motor cable.
Compliance with these requirements means the drive can be incorporated into lift systems built to EN 12015.

7.2.7 Connection of AC and DC chokes (optional)

(For three-phase ADL500 only). The drive can use both a three-phase choke on the AC power line and, for 1040 ... 3220 sizes only, a DC choke between terminals C1 and C.
Refer to chapter "5.2 Input chokes" for the recommended connections.
If no DC choke is used on 1040 ... 3220 sizes, terminals C1 and C must be bridged.

ATTENTION!

If no DC choke is used, terminals C1 and C must be bridged (sizes 1-2-3).

7.3 Regulation section

NOTE!

All terminal blocks are removable. For electrical properties of analog, digital and relay inputs/outputs **see section A.2 of the Appendix**.

7.3.1 Cable cross-sections

Terminals	Maximum cable cross-section		Recommended stripping	Tightening torque (min)
	[mm²]	[AWG]	[mm]	[Nm]
T3, T4, SFTY-STO	0.2 ... 2.5 (1 cable) 0.2 ... 0.75 (2 cables)	26 ... 12 26 ... 19	5	0.4
T1, T2, XER, XE	0.2 ... 1.5 (1 cable) 0.2 ... 0.5 (2 cables)	26 ... 16 26 ... 19	5	0.25

7.3.2 I/O and Relays connection

NOTE!

For terminal location see section "7.1 Location and identification of terminals and LEDs".

T3 terminal - Relays Output

Pin	Signal	Description	*Command* **Associated parameter**	ADL510	ADL530	ADL550
50	**RO_4O**	Relay 4 output (contact N.O., 24 Vdc)	**1416, Dig output 4 src**	Yes	Yes	Yes
51	**RO_4C**	Common Relay 4	*DoorOpen*	Yes	Yes	Yes
52	**RO_3O**	Relay 3 output (contact N.O., 24 Vdc)	**1414, Dig output 3 src**	Yes	Yes	Yes
53	**RO_3C**	Common Relay 3	*Run Contactor*	Yes	Yes	Yes
54	**RO_2O**	Relay 2 output (contact N.O., 24 Vdc)	**1412, Dig output 2 src**	Yes	Yes	Yes
55	**RO_2C**	Common Relay 2	*Brake Contactor*	Yes	Yes	Yes
56	**RO_1O**	Relay 1 output (contact N.O., 24 Vdc)	**1410, Dig output 1 src**	Yes	Yes	Yes
57	**RO_1C**	Common Relay 1	*Drive OK*	Yes	Yes	Yes

T1 terminal - Digital inputs

Pin	Signal	Description	*Command* **Associated parameter**	ADL510	ADL530	ADL550
1	**DI_8**	Digital input 8	*Contactor feedback*	Yes	Yes	Yes
2	**DI_7**	Digital input 7	*Feedback brake*	Yes	Yes	Yes
3	**DI_6**	Digital input 6	*Multispeed 2*	Yes	Yes	Yes
4	**DI_5**	Digital input 5	*Multispeed 1*	Yes	Yes	Yes
5	**DI_4**	Digital input 4	*Multispeed 0*	Yes	Yes	Yes
6	**DI_3**	Digital input 3	*Emergency*	Yes	Yes	Yes
7	**DI_2**	Digital input 2	*Start reverse*	Yes	Yes	Yes
8	**DI_1**	Digital input 1	*Start forward*	Yes	Yes	Yes

T4 terminal - Enable / reference digital inputs and +24V

Pin	Signal	Description	*Command* **Associated parameter**	ADL510	ADL530	ADL550
9	**EN_HW**	Enable digital inputs		Yes	Yes	Yes
10	**DI_CM**	Common reference digital inputs		Yes	Yes	Yes
11	**0V24_OUT**	Ground reference output voltage		Yes	Yes	Yes
12	**+24V_OUT**	+24 Vdc output voltage power supply		Yes	Yes	Yes

T2 terminal - Analog inputs

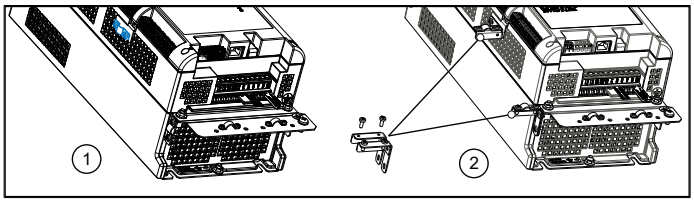
Pin	Pin*	Signal	Description	*Command* **Associated parameter**	ADL510	ADL530	ADL550
1	**40**	**AI_2N**	Common reference analog input 2		-	Yes	Yes
2	**41**	**AI_2P**	Analog input 2 reserved to motor temperature sensor	4530, Ptc Type	-	Yes	Yes
3	**42**	**AI_1P**	Analog input 1 reserved for analog speed reference		Yes	Yes	Yes
4	**43**	**AI_1N**	Common reference analog input 1		Yes	Yes	Yes

* Only for regulation boards from -9 onwards.

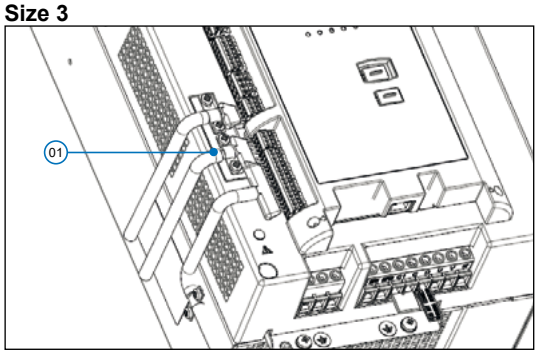
T2 terminal shield connection (recommended)

(1) Secure the braided shielded cable to the omega at terminal T2 (in the case of reduced lateral space it is possible to use the GND PLATE KIT (2), **code S72684G13** - only for size 1 and 2).

Size 1 and 2



Size 3



Size 4

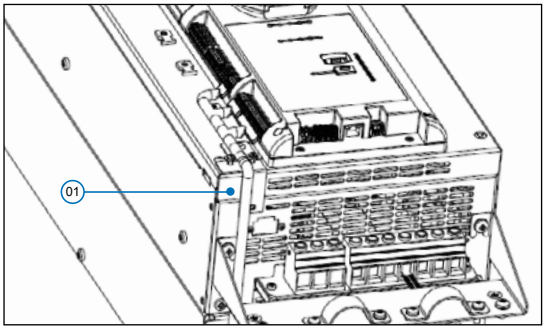


Figure 7.3.2.1: Connection of shielding (recommended)

7.3.3 Feedback Connection

NOTE! For terminal location see section "7.1 Location and identification of terminals and LEDs".

XER terminal

Pin	Signal	Description	Direction	ADL510	ADL530	ADL550
20	BR–	Channel B (–) repeat	OUT	Yes	Yes	Yes
21	BR+	Channel B (+) repeat	OUT	Yes	Yes	Yes
22	AR–	Channel A (–) repeat	OUT	Yes	Yes	Yes
23	AR+	Channel A (+) repeat	OUT	Yes	Yes	Yes

XE terminal

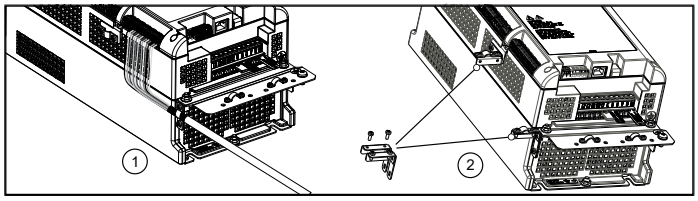
Pin	Pin (*)	Signal		Description	Digital Incremental	Sinusoidal Incremental	Sinusoidal Incremental + Sin/Cos	Sinusoidal Incremental + Absolute	Direction	ADL510	ADL530	ADL550
		#1	#2									
1	71	FH2		Fast (Freeze) 2 input	x	x	x	x	IN	-	-	Yes
2	72	FH1		Fast (Freeze) 1 input	x	x	x	x	IN	-	-	Yes
3	73	COM_ FH		Common Fast inputs	x	x	x	x	IN	-	-	Yes
4	74	COS–	DT–	Channel Cos - / Data -			x	x	IN / BID	-	Yes	Yes
5	75	COS+	DT+	Channel Cos + / Data +			x	x	IN / BID	-	Yes	Yes
6	76	SIN–	CK–	Channel Sen - / Clock -			x	x	IN / OUT	-	Yes	Yes
7	77	SIN+	CK+	Channel Sen + / Clock +			x	x	IN / OUT	-	Yes	Yes
8	78	Z–		Channel Z –	x	x	x	x	IN	Yes	Yes	Yes
9	79	Z+		Channel Z +	x	x	x	x	IN	Yes	Yes	Yes
10	80	B–		Channel B –	x	x	x	x	IN	Yes	Yes	Yes
11	81	B+		Channel B +	x	x	x	x	IN	Yes	Yes	Yes
12	82	A–		Channel A –	x	x	x	x	IN	Yes	Yes	Yes
13	83	A+		Channel A +	x	x	x	x	IN	Yes	Yes	Yes
14	84	0VE		Encoder reference	x	x	x	x	OUT	Yes	Yes	Yes
15	85	+VE		Encoder supply	x	x	x	x	OUT	Yes	Yes	Yes

(*) Only for regulation boards from -9 onwards.

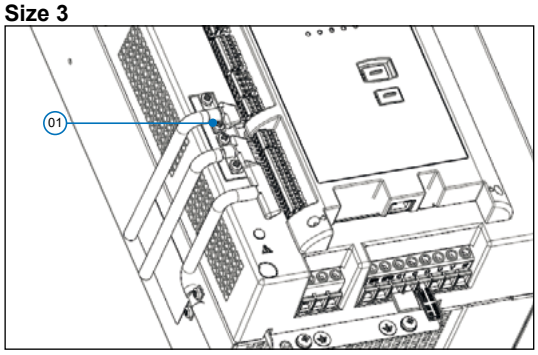
Size 1 and 2

XE terminal shield connection (recommended)

(1) Secure the braided shielded cable to the omega at terminal XE (in the case of reduced lateral space it is possible to use the GND PLATE KIT (2), code S72684G13 - only for size 1 and 2).



Size 3



Size 4

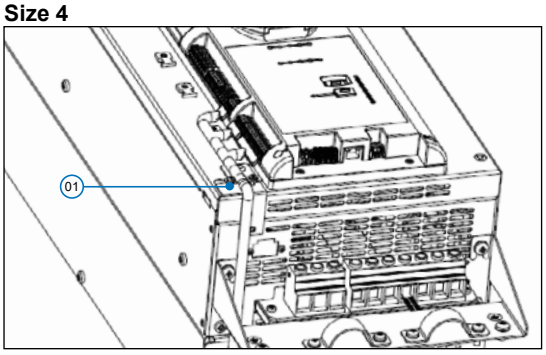


Figure 7.3.3.1: Connection of shielding (recommended)

Encoders provide motor speed and position feedback.
The regulation algorithms in the ADL500 drive are capable of controlling asynchronous and permanent magnet synchronous (brushless) motors. With asynchronous motors the regulation algorithm may or may not use the speed measurement obtained from the encoder reading. With brushless motors the regulation algorithm needs an encoder that also allows the absolute motor position to be verified.

ATTENTION!

The ADL500 supports several encoder types.
The type of encoder that is connected must be selected via software: PAR 2132 Encoder mode (menu ENCODER).

Possible configurations are summarised in the next table:

	ADL510	ADL530	ADL550	Asynchronous		Brushless
				ASY SSC ASY SLS (1)	ASY FOC (1)	SYN FOC (1)
Incremental digital	**Yes**	**Yes**	**Yes**	-	Recommended	Possibile
Incremental sinusoidal	**Yes**	**Yes**	**Yes**	-	Recommended	Possibile
Incremental sinusoidal + absolute SinCos	**-**	**Yes** (2)	**Yes**	-	Possible	Recommended
Incremental sinusoidal + Absolute Endat	**-**	**Yes** (2)	**Yes**	-	Possible	Recommended
Absolute Endat	**-**	**Yes**	**Yes**	-	Possible	Recommended
SSI	**-**	**Yes**	**Yes**	-	Possible	Recommended
Absolute Biss	**-**	**Yes**	**Yes**	-	Possible	Recommended

(1) PAR 540 **Control type** (2) ADL530: "freeze" not available - = encoder not used

Encoders must be fitted to the motor shaft using anti-backlash couplings.
The best control is achieved with configurations that have incremental sinusoidal channels.
For electrical connections always use good quality cables with shielded twisted pairs, according to the procedures and specifications described in the following paragraphs.

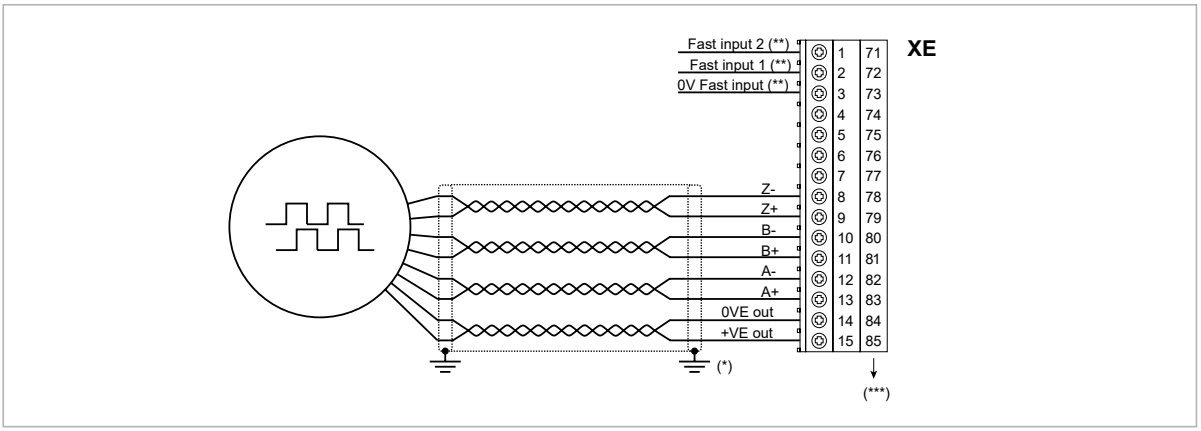
The configuration parameters for each encoder can be found in the encoder.
In the event of an encoder malfunction the drive generates the **Speed fbk loss** alarm and the cause of the malfunction is shown in parameter 2172 **SpdFbkLoss code**.
If the encoder is not used by the regulation algorithm the drive still manages the encoder position reading but does not generate an alarm in case of malfunctioning.

(1) Connection digital Encoder 3 channels (ADL510, ADL530) - Connection digital Encoder 3 channels + 2 Freeze (ADL550) (TTL Line Driver / push pull)

Technical specifications

Channels	A+ A-, B+ B-, Z+ Z-, differential line drivers/push pull.
Management of loss of encoder signals (via software).	
Max frequency	100 kHz (check the number of encoder impulses according to the maximum speed).
Number of impulses	min 128, max 16384 (default 1024).
Electrical interface	TTL (ref. GND) Ulow ≤ 0.5 V Uhigh ≥ 2.5 V.
Load capacity	13 mA @ 5.5 V (Zin 300 Ω).
Programmable internal power supply	min +5.2 V, max +20 V (default + 5.2 V) - Imax 150 mA. The internal power supply of the encoder can be selected from the keypad (ENCODER menu, parameter **Encoder supply** (PAR 2102) to balance the loss of voltage due to the length of the encoder cable and load current. PAR 2102 **Encoder supply**, range: min=5.2 V, max= 20 V, step of 0.1 V; default=5.2 V.
Cable length	max 50 m.

If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.



(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

Figure 7.3.3.7: Connection digital encoder 3 Channels + 2 Freeze (TTL Line Driver / push pull)

(2) TTL 3 Channel Digital Encoder Connection (ADL510, ADL530) - 3 Channel Digital Encoder Connection + 2 Freeze (ADL550) (TTL single ended push pull)

The following resistive divider must be added on single-ended configurations.
If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.

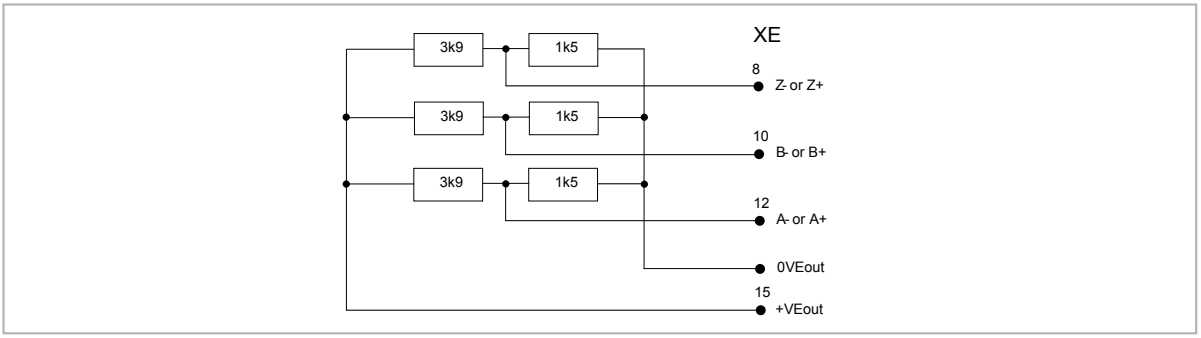


Figure 7.3.3.8: Resistive divider for single-ended configurations

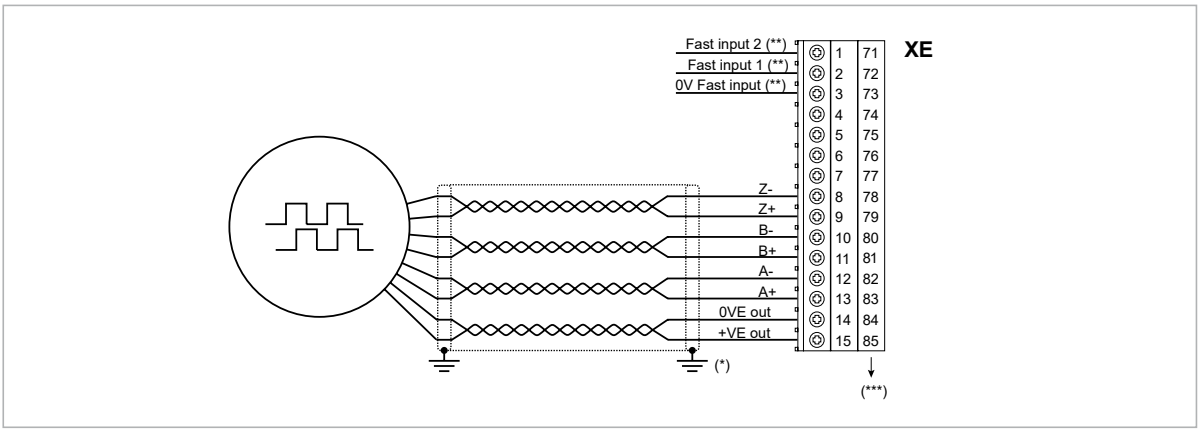
(3) HTL 3 Channel Digital Encoder Connection (ADL510, ADL530) - 3 Channel Digital Encoder Connection + 2 Freeze (ADL550) (HTL differential push pull). Available only for regulation board -9A or upper

Technical specifications

Channels	A+, B+, Z+, differential push pull. Managed lack of encoder signals (via software).
Max frequency	100 kHz (check the number of encoder pulses as a function of the maximum speed).
Number of impulses	min 128, max 16384 (default 1024).
Electrical interface	Push pull (ref. GND) Ulow ≤ 2 V - Uhigh ≥ (0,7 * (+VE)) V.
Programmable internal power supply	min +5.2 V, max +20 V (default +5.2 V) - Imax 150 mA. Via keypad (ENCODER menu, parameter Encoder supply (PAR 2102) you can select the value of the encoder internal supply voltage to compensate for the voltage reduction due to the length

	of the encoder cable and the load current. PAR 2102 Alimentaz encoder, range: min=5.2 V, max= 20 V, minimum step 0.1 V; default=5.2 V.
Cable length	50 m max.

If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.



(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

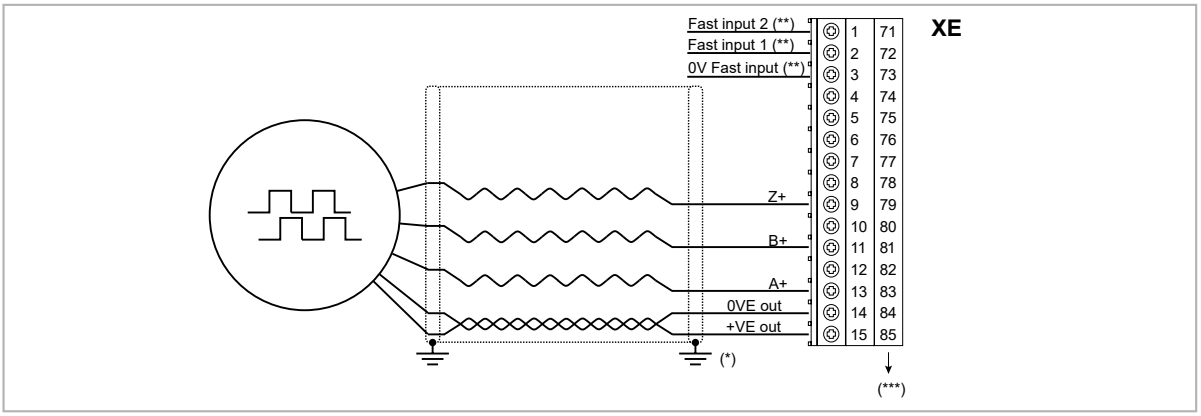
Figure 7.3.3.9: Connection digital encoder 3 channels + 2 freeze (HTL Line Driver / differential push pull) available only for regulation board -9A or upper.

(4) HTL 3 Channel Digital Encoder Connection (ADL510, ADL530) - 3 Channel Digital Encoder Connection + 2 Freeze (ADL550) (HTL single ended push pull)

Technical specifications

Channels	A+, B+, Z+, single ended push pull. Managed lack of encoder signals (via software).
Max frequency	100 kHz (check the number of encoder pulses as a function of the maximum speed).
Number of impulses	min 128, max 16384 (default 1024).
Electrical interface	Push pull (ref. GND) Ulow ≤ 2 V - Uhigh ≥ (0,7 * (+VE)) V.
Programmable internal power supply	min +5.2 V, max +20 V (default +5.2 V) - Imax 150 mA.
	Via keypad (ENCODER menu, parameter Encoder supply (PAR 2102) you can select the value of the encoder internal supply voltage to compensate for the voltage reduction due to the length of the encoder cable and the load current. PAR 2102 Encoder supply, range: min=5.2 V, max= 20 V, minimum step 0.1 V; default=5.2 V.
Cable length	50 m max.

If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.



(*) Shielding connection, see Figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

Figure 7.3.3.10: 3 Channel Digital Encoder Connection + 2 Freeze (HTL single ended push pull)

If you want to use a single ended HTL encoder, you have to connect only the positive signals (A+, B+ and Z+) and connect to the negative inputs (A-, B-, Z-) the resistance circuit plus zener diode.

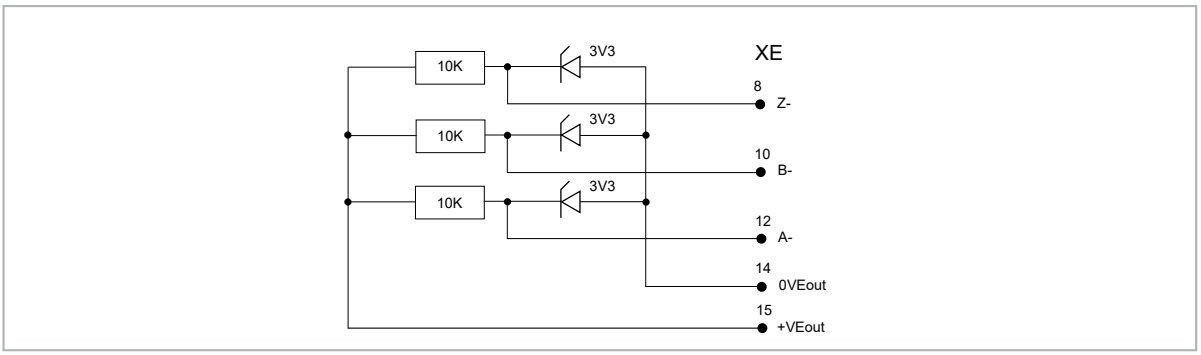


Figure 7.3.3.11: Circuit with resistance and zener diode

The choice of the 3.3 V zener diode is the one that gives better results in terms of signal level discrimination. Zener diodes up to 5.1 V can still be used.
If diode zener are not available, it is possible to use also one resistive divider how in the follow figure.

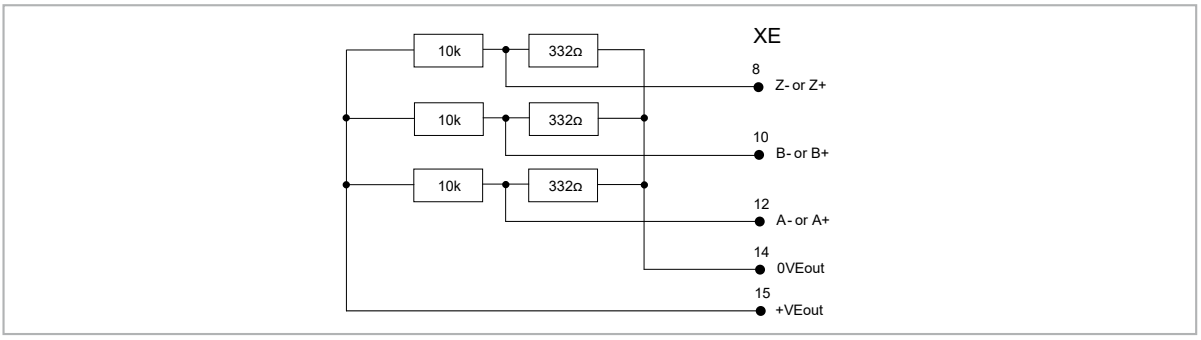


Figure 7.3.3.12: Resistive HTL circuit.

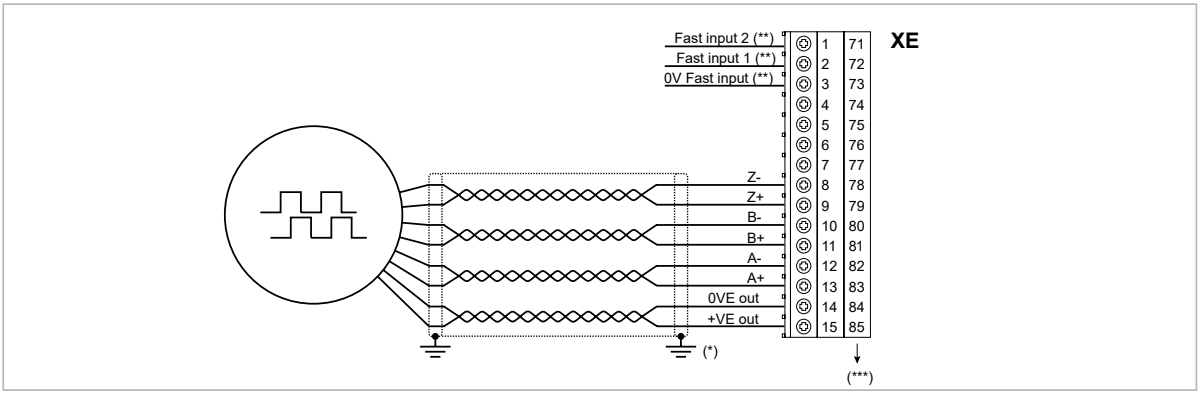
(5) Connection sinusoidal encoder 3 Channels (ADL510, ADL530) - Connection sinusoidal encoder 3 Channels + 2 Freeze (ADL550)

Technical specifications

Channels	A+ A-, B+ B-, Z+ Z-, differential. Management of loss of encoder signals.
Max frequency	200 kHz (check the number of encoder impulses according to the maximum speed).
Number of impulses	min 128, max 16384 (default 1024).
Electrical interface	Channels A/B 0.6 V ≤ Vpp ≤ 1.2 V (typ. 1.0 V) – Channel Z* 0.2 V ≤ Vpp ≤ 0.8 V.
Load capacity	Channels A/B/Z* 8 mA @ 1.0 Vpp (Zin 120 Ω).
Programmable internal power supply	min +5.2 V, max +20 V (default + 5.2 V) – Imax 150 mA. The internal power supply of the encoder can be selected from the keypad (ENCODER menu, parameter **Encoder supply** (PAR 2102) to balance the loss of voltage due to the length of the encoder cable and load current. PAR 2102 E**ncoder supply,** range: min=5.2 V, max= 20 V step of 0.1 V; default=5.2 V.
Cable length	max 50m.

* Channel Z = I (Index mark)

If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.



(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

Figure 7.3.3.3: Connection sinusoidal encoder 3 Channels + 2 Freeze

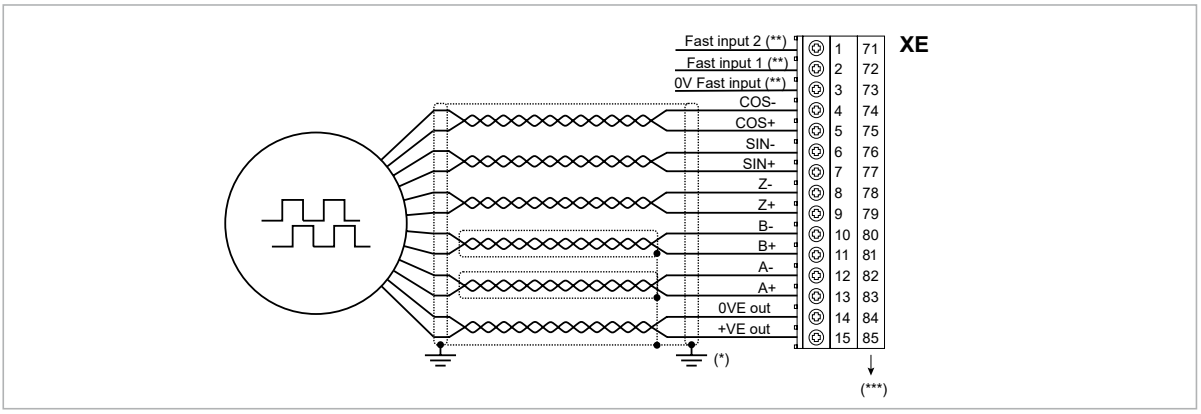
(6) Connection SinCos encoder (ADL530) - Connection SinCos encoder + 2 Freeze (ADL550)

Technical specifications

Channels	A+ A-, B+ B-, Z+ Z-, Sin+ Sin-, Cos+ Cos-, differential. Management of loss of encoder signals.
Max frequency	200 kHz (check the number of encoder impulses according to the maximum speed).
Electrical interface	Channels A/B/Sin/Cos 0.6 V ≤ Vpp ≤ 1.2 V (typ. 1.0 V) — Channel Z* 0.2 V ≤ Vpp ≤ 0.8 V.
Load capacity	Channels A/B/Z* 8 mA @ 1.0 Vpp (Zin 120 Ω). Channels Sin/Cos 1 mA @ 1.0 Vpp (Zin 1 kΩ).
Programmable internal power supply	min +5.2 V, max +20 V (default + 5.2 V) — Imax 150 mA. The internal power supply of the encoder can be selected from the keypad (ENCODER menu, parameter **Encoder supply** (PAR 2102) to balance the loss of voltage due to the length of the encoder cable and load current. PAR 2102 **Encoder supply,** range: min=5.2 V, max=20 V, step of 0.1 V; default=5.2 V.
Cable length	max 50 m.

* Channel Z = I (Index mark)

If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.



(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

Figure 7.3.3.2: Connection SinCos encoder + 2 Freeze

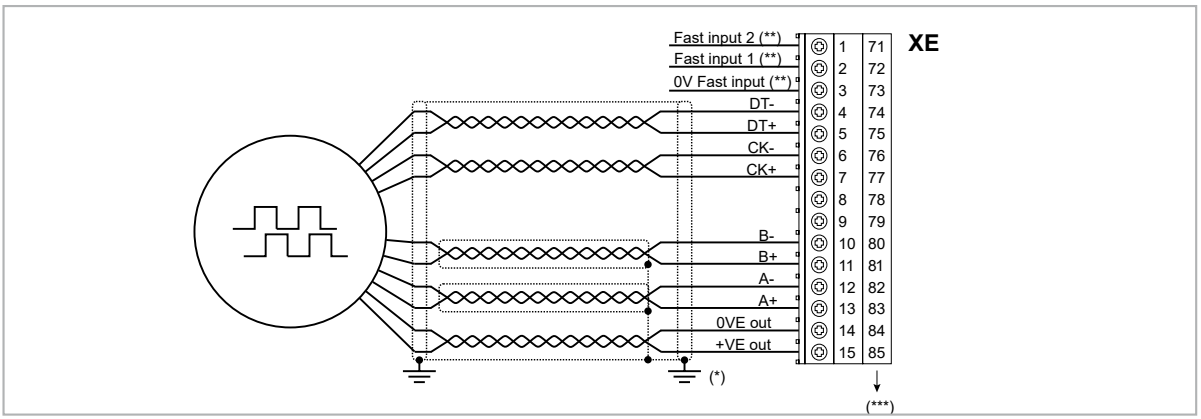
(7) Connection EnDat or SSI Encoder (ADL530) - Connection EnDat Encoder + 2 Freeze (ADL550)

Technical specifications

Channels	A+ A-, B+ B-, differential. Management of loss of encoder signals.
Max frequency	200 kHz (check the number of encoder impulses according to the maximum speed).
Number of impulses	min 128, max 16384 (automatic recognition at initilization).
Electrical interface	0.6 V ≤ Vpp ≤ 1.2 V (typ. 1.0 V).
Load capacity	8 mA @ 1.0 Vpp (Zin 120 Ω).
Programmable internal power supply	min +5.2 V, max +20 V (default + 5.2 V) — Imax 150 mA. The internal power supply of the encoder can be selected from the keypad (ENCODER menu, parameter **Encoder supply** (PAR 2102) to balance the loss of voltage due to the length of the encoder cable and load current. PAR 2102 **Encoder supply,** range: min=5.2 V, max= 20 V step of 0.1 V; default=5.2 V.
Cable length	max 50m.
Absolute channels	CK+ CK-, DT+ DT- differential, RS-485. Management of loss of encoder signals.
Interface	EnDat: 2.1/2.2 single/multi-turn (command set managed only compatible with 2.1). SSI: Standard Sick/Stegman single/multi-turn.
Max frequency	EnDat: 1 MHz with delay compensation (not programmable). SSI: 400 KHz (not programmable).
Number of bits	EnDat: max 32 bit/turn* max 32 bit/turn (automatic recognition at initilization). SSI:13-25 bits (default 25).

NOTE!

The loss of a digital track (for example a CK or a DT) during normal operation of the motor (if SPD FBK LOSS alarm is not activated) may not be immediately reported but, if the incremental tracks continue to function correctly, the motor continues to move safely. As soon as a digital track is questioned by the drive and there is no response then the drive goes into alarm.



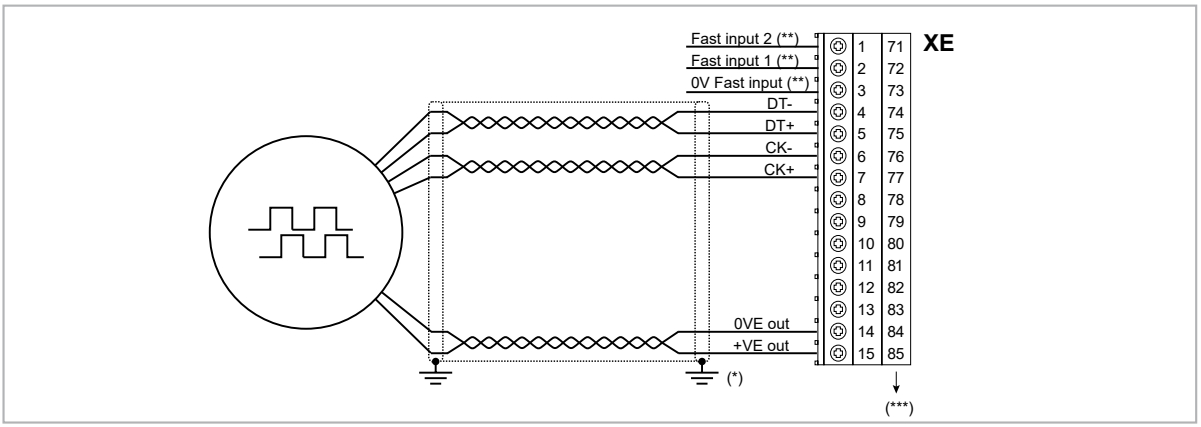
(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

Figure 7.3.3.4: Connection EnDat Encoder + 2 Freeze

(8) Connection Encoder EnDat Full Digital (ADL530) - Connection Encoder EnDat Full Digital + 2 Freeze (ADL550)

Technical specifications

Programmable internal power supply	min +5.2 V, max +20 V (default + 5.2 V) — Imax 150 mA.
Cable length	max 50m.
Absolute channels	CK+ CK-, DT+ DT- differential, RS-485. Management of loss of encoder signals.
Interface	EnDat: 2.1/2.2 single/multi-turn (command set managed only compatible with 2.1).
Max frequency	EnDat: 1.5 MHz with delay compensation (not programmable).
Number of bits	EnDat: max 32 bit/turn* max 32bit/turn (automatic recognition at initilization).



(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

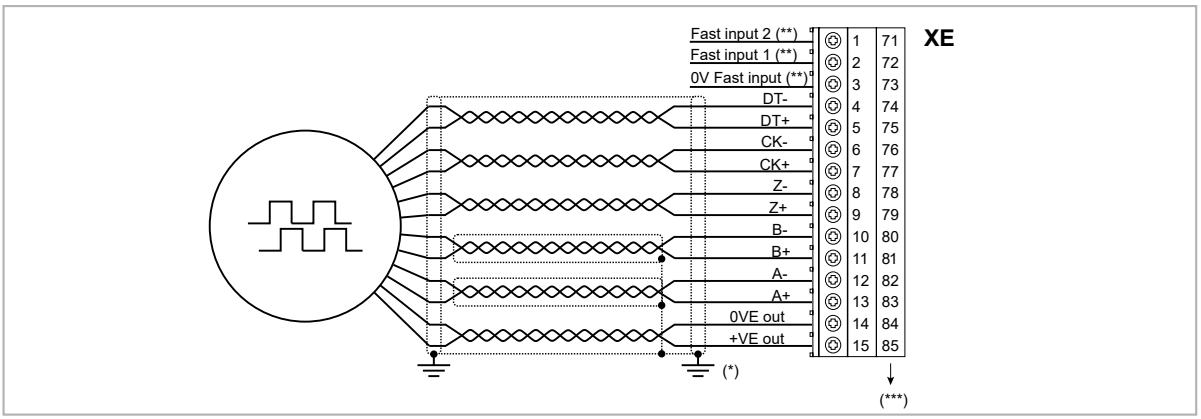
Figure 7.3.3.6: Connection EnDat Full Digital Encoder + 2 Freeze

(9) Connection Encoder Biss (ADL530) - Connection Encoder Biss + 2 Freeze (ADL550)

Technical specifications

Channels	A+ A-, B+ B-, differential. Management of loss of encoder signals.
Max frequency	200 kHz (check the number of encoder impulses according to the maximum speed).
Number of impulses	min 128, max 16384 (automatic recognition at initilization).
Electrical interface	0.6 V ≤ Vpp ≤ 1.2 V (typ. 1.0 V).
Load capacity	8 mA @ 1.0 Vpp (Zin 120 Ω).
Programmable internal power supply	min +5.2 V, max +20 V (default + 5.2 V) — Imax 150 mA. The internal power supply of the encoder can be selected from the keypad (ENCODER menu, parameter **Encoder supply** (PAR 2102) to balance the loss of voltage due to the length of the encoder cable and load current.
Cable length	max 100 m.
Absolute channels	CK+ CK-, DT+ DT- differential, RS-485. Management of loss of encoder signals.
Interface	BiSS Rev. C6 single / multi-turn point-to-point network.
Max frequency	10 MHz up to 100 m cable length.
Number of bits	64 max.

If Z channel is present on encoder and cabled on ADL500 inputs, for use it features, It must be activated by parameter 2110 Encoder parameter check.

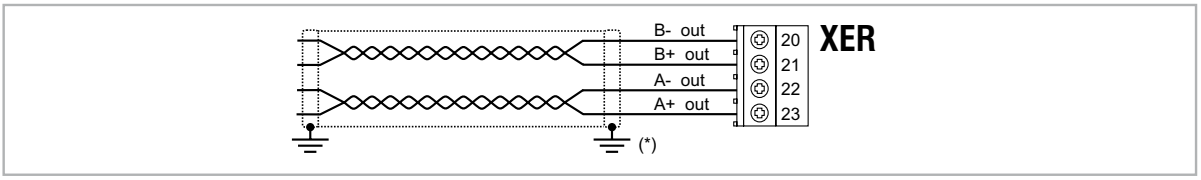


(*) Connection of shielding, see figure 7.3.3.1. (**) On ADL550 only. (***) Only for regulation boards from -9 onwards.

Figure 7.3.3.5: Connection Encoder Biss + 2 Freeze

(10) Repeat Encoder (TTL line-driver) (ADL510-530-550)

ADL500 have an incremental encoder output with TTL Line Driver levels to be used to repeat the servomotor feedback device.
This function is performed via HW and an encoder output can be repeated with a programmable divider.
The encoder output signals are available on the XER connector.



(*) Connection of shielding, see "Figure 7.3.3.1".

Figure 7.3.3.13: Repeat Encoder

ATTENTION!

The encoder reversal activated via the "Encoder direction" parameter (**PAR 2130**) has no effect on the encoder repeat; to standardise the signals, it will be necessary to reverse the wiring on the XER connector:
A+ < - > A-
B+ < - > B-

Technical specifications

Channels	A+ A-, B+ B-, differential line drivers, optoisolated.
Max frequency	200 kHz.
Number of impulses	1/1-1/2-1/4-1/8 repeat (default 1/1).
Electrical interface	TTL (ref. GND) Ulow ≤ 0.5V Uhigh ≥ 2.5V.
Load capacity	TTL 20mA for each channel.
Cable length	max 50 m.

7.3.3.1 Phasing

In order for the ADL500 Brushless regulation algorithm to function correctly, it is necessary to know the position of the rotor with respect to the stator power phases. Therefore the 0° position provided by the absolute encoder must be known with respect to the position of a motor pole and the encoder count direction must match the motor power phases.
This is called phasing. **Phasing** can be performed manually, directly by means of the mechanical encoder assembly position on the motor shaft and on the phases, or using the automatic procedures available in the drive.

Phasing must always be repeated whenever:

- the encoder assembly position is changed;
- the phase sequence of the motor power supply connection is changed;
- the encoder incremental signal connection is changed;
- the encoder absolute signal connection is changed;
- the value of the PAR 2008 **Pole pairs** parameter is changed;
- the value of the PAR 2100 **Encoder pulses** parameter is changed;
- the drive is replaced (alternatively, download parameters taken from previous drive).

There are two different procedures that can be launched by writing two different parameters:

- PAR 2190 **Autophase rotation** → rotation phasing:

this procedure must be performed with the motor free to turn and with no load applied. This procedure is enabled by a normal lift sequence, for example using inspection buttons. For security reasons Brake contactor is not opened by drive and must be opened by maintainer.

- PAR 2192 **Autophase still** → static phasing:

this procedure must be performed with the motor still and brake applied. This procedure is enabled by a normal lift sequence, for example using inspection buttons. Brake contactor is not opened by drive.

Rotation phasing
This procedure is based on the possibility of moving the motor, by a maximum angle of two pole pairs, to find correct encoder phasing, cross-check the available encoder and motor data and, if the encoder count direction does not match the phase sequence of the motor power supply, correct it by automatically modifying PAR 2130 **Encoder direction**.

NOTE! In the case described above, a positive speed reference could generate a rotation in reverse with respect to that defined as positive for the encoder (usually clockwise), while still ensuring good motor control.

If you prefer to keep the encoder as positive direction for the references, you need to exchange two phases of motor power and repeat the phasing procedure by rotation.
If the procedure ends without error, the code 0 is shown on the keypad, otherwise if some inconsistencies that cannot be corrected by the drive will display one of the codes listed in Self-learning (phasing), see chapter "10.3 Messages".
The anomalies found concern

- electrical signals not detected with **Speed fbk loss [22]** alarm
- error setting PAR 2008 **Polar pairs**
- error setting PAR 2100 **Encoder pulses**

Static phasing
Using this method, in which the motor cannot move, the encoder and motor data cannot be cross-checked to verify the matching of parameters or count direction.
This condition must therefore be checked before launching the procedure.

Autophasing without absolute encoders
If a digital or sinusoidal incremental encoder is mounted on a brushless motor that does not have absolute tracks, we run into the need to phase the position of the rotor with respect to the stator of the motor at least every time the drive is turned on. The timing of the phasing function is defined by parameter 2194 Autophase mod int which allows rephasing only after the drive is turned on at the first motor start or at every motor start or periodically. The moment in which the drive performs the phasing is warned by tones emitted by the motor. If you do not want to hear the tones every time the motor is turned on, you must set parameter 2194=1 First enable.

7.3.4 +24V supply connection

NOTE! For terminal location see section "7.1 Location and identification of terminals and LEDs".

Terminal	Terminal (*)	Description	IN/OUT
1	**0**	0 Vdc external power supply reference	IN
2	**24**	+24 Vdc External power supply of the regulation board	IN

(*) Only for regulation boards from -9 onwards.

7.3.5 Safety STO connection (SFTY-STO)

NOTE! For terminal location see section "7.1 Location and identification of terminals and LEDs".

Terminal	Description	IN/OUT
EN+	Enable Safety (+)	IN
EN-	Enable Safety (-)	IN
OK1	Safety OK, Output 1	OUT
OK2	Safety OK, Output 2	OUT

The EN+, EN-, OK1 and OK2 terminals must be connected as shown in the typical connection diagrams in chapter **"7.9 - Connection diagrams"**.

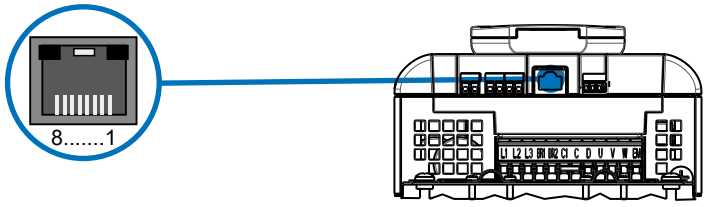
Safety management is integrated in the firmware. The Safety must be enabled to enable the drive.
The drive is disabled if the Safety enable command is removed while it is enabled.
To re-enable the drive, re-enable the Safety then remove and re-send both the Enable and Start commands.

7.3.6 LEDs

NOTE! For terminal location see section **"7.1 - Location and identification of terminals and LEDs"**.

LED	Colour	Meaning	ADL510	ADL530	ADL550
BRK	Yellow	Braking	Yes	Yes	Yes
CNT	Yellow	Contactor closing command status	Yes	Yes	Yes
EN	Green	Enable	Yes	Yes	Yes
LIM	Red	Current limit	Yes	Yes	Yes
AL	Red	Generic alarm	Yes	Yes	Yes
CAN	Green	CAN 1	-	Yes	Yes
S-BY	Yellow	Stand-by	-	-	Yes
UP	Green	Direction up	-	-	Yes
DOWN	Green	Direction down	-	-	Yes
PWR	Green	Power Supply ON	-	-	Yes

7.4 ETH-PC Ethernet Interface (RJ45 connector)



The ADL Drive is standard equipped with an RJ45 port for connection via ModbusTCP protocol, used for Drive-PC communication (with WEG_DriveLabs configuration software), and HTTPS protocol used for Drive-PC / network communication (with WEG_DriveLabs web application).
Minimum requirements for Ethernet cable: shielded category 5E, maximum length 10 m.
Speed: 100 Mbit/s.

Pin	Signal	Description	IN/OUT	ADL510	ADL530	ADL550
1	**EN0TX+**	Data transmission (+)	OUT	Yes	Yes	Yes
2	**EN0TX-**	Data transmission (-)	OUT	Yes	Yes	Yes
3	**EN0RX+**	Data reception (+)	IN	Yes	Yes	Yes
4	**N.C.**	n.c.	-	Yes	Yes	Yes
5	**N.C.**	n.c.	-	Yes	Yes	Yes
6	**EN0RX-**	Data reception (-)	IN	Yes	Yes	Yes
7	**N.C.**	n.c.	-	Yes	Yes	Yes
8	**N.C.**	n.c.	-	Yes	Yes	Yes

7.4.1 Ethernet Configuration

Some familiarity and knowledge of IP networking topics is required to establish communication between the **ADL500** and a **PC**.
Based on the Ethernet configuration, during start-up, the drive acquires an IP address which is retained until reboot. Any change to the Ethernet configuration is applied when the drive is restarted.

The IP address is acquired based on the following configuration parameters:

Menu	Parameter	Description	
NETWORK CONFIG	9608	**IP Assignment**	IP address assignment method: static or DHCP based
NETWORK CONFIG	9556	**IP Address set**	Valid only if static assignment is selected. Statically configured IP address
NETWORK CONFIG	9558	**IP Netmask set**	Valid only if static assignment is selected. Statically configured IP netmask
NETWORK CONFIG	9560	**IP Gateway set**	Valid only if static assignment is selected. Statically configured IP gateway

The following are read-only parameters:

Menu	Parameter	Description	
DRIVE INFO	9562	**IP address**	Current IP Address. IP address acquired by ADL500
DRIVE INFO	9600	**MAC Address**	MAC Address

7.4.2 Point-to-point network topology

The PC is directly connected to the ADL500.
The default IP assignment method of the ADL500 is Static (PAR 9608 Ip Assignment set to "Static") and the ADL500 will be reachable at the address configured in the IP Address set parameter (PAR 9556) in the network specified by the netmask in the IP Netmask set parameter (PAR 9558).
The default values are as follows:

- The Static address of the ADL500 is 169.254.10.10
- The IP address of the PC should be set to 169.254.x.y, with any value except 169.254.10.10, which is already assigned to the ADL500;
- The IP netmask of the drive is set to 255.255.0.0; assign the same netmask value to the PC.

For more details on network configuration, see Appendix "A.3 Windows PC Network Configuration".

7.4.3 DHCP network topology

When the ADL and the PC are not directly connected but are connected in a network, if the network has a DHCP server, both the ADL and the PC network card can be configured in DHCP mode
It may take up to 2 minutes for the drive to acquire the DHCP address. If the drive does not find any DHCP server, the default address 169.254.10.10 is assigned
For more details on PC network configuration, see Appendix "A.3 Windows PC Network Configuration".

7.5 CAN interface

NOTE! For terminal location see section "**7.1 Location and identification of terminals and LEDs**".

CANopen is a communication profile for CAL-based industrial systems (refer to the CANopen CAL-Base COMMUNICATION PROFILE for Industrial Systems; CiA Draft Standard 301 Version 4.2 Date 13 February 2002 by CAN in Automation e. V.).
The ADL530 and ADL550 integrates the interface for connection to CAN networks and also implements the DS417 profile according to CANopen 2.0.0 specifications.
The CAN protocol (ISO 11898) used is CAN2.0A with 11-bit identifier. The integrated CANopen interface has been developed as a Minimum Capability Device. Data are exchanged cyclically; the master reads the data made available by the slaves and writes the reference data to the slaves.
The interface is provided with functional isolation (> 1 kV).
Connection is via the CAN connector and no power supply is required.

Terminal	Name	Function	Cable cross-section
L	CAN_L	CAN_L bus line (low dominant)	0.2 ... 2.5 mm² AWG 26 ... 12
SH	CAN_SHLD	CAN shielding	
H	CAN_H	CAN_H bus line (high dominant)	

LED	Meaning
CAN (green)	
Off	Stop
Flashing	Pre-operational
On	Operational

A shielded twin-pair (of the type described in the CANopen specifications) must be used for connection to the bus, and must be laid separately from the power cables, at a distance of at least 20 cm. Cable shielding must be grounded at the two ends. If the cable shielding is grounded at different points of the system, use equipotential connection cables to reduce the current flow between the drive and the CANbus master.

NOTE! **As regards terminations:** the first and last termination on the CAN network must have a 120 ohm resistor between pins L and H.

If the ADL500 drive is in one of these positions, the termination resistor can also be inserted setting parameter 4008 Can Termin resistor = 1 (CAN1) on "6.1 CONTROL COMM" menu.

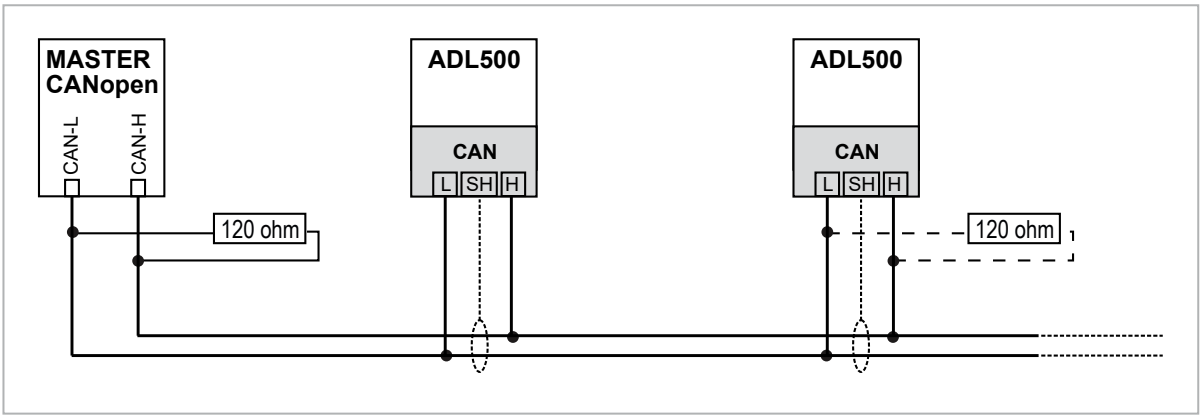
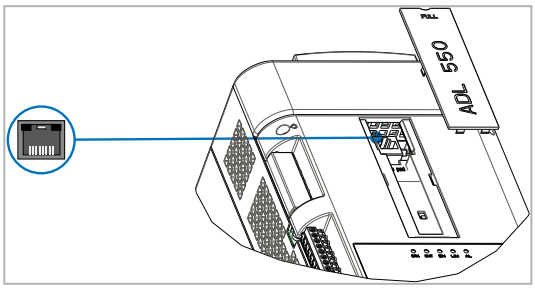


Figure 7.5.1: CANbus connection

7.6 Optional Keypad interface (RJ45 connector)



The female RJ45 port on the front of the inverter is used to mechanically attach and connect the optional KB-ADL500 keypad. The optional KB-ADL500 keypad is automatically recognised and managed by the drive.

CAUTION!

The connection have no galvanic isolation!

This port is only for keypad use. DO NOT CONNECT your PC here. For PC connection refer to the dedicated port ETH-PC.

CAUTION!

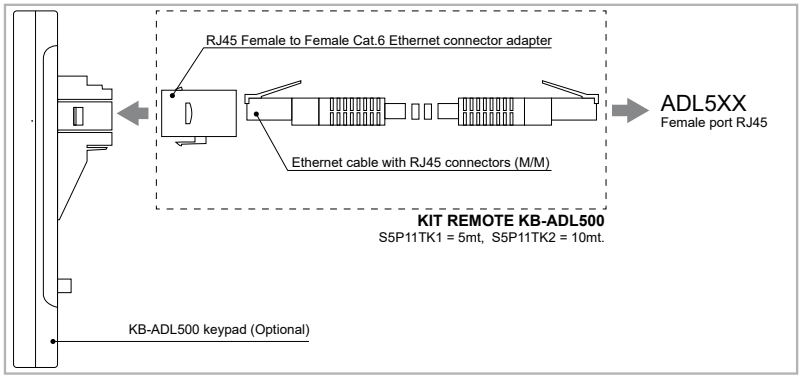
KIT REMOTE KB-ADL500

The keypad can be used remotely from distances of up to 5 or 10 m: using the appropriate KIT REMOTE KB-ADL500 5m/10m, codes S5P11TK1 and S5P11TK2 respectively.

CAUTION!

The kits consist of an Ethernet cable with male RJ45 connectors and a female-to-female adapter.

Properly attach the F/F adapter to the optional keypad as shown in the figure:



7.7 USB port

For ADL550 and ADL530 only.

NOTE!

For port location see section "7.1 Location and identification of terminals and LEDs".

Connection to a PC is not possible with this USB port.

USB 2.0 port for saving data to a common USB memory ( ).

Type A connector.
Max current available 150 mA.
The USB memory device must be formatted in FAT 32.

For additional information see section **"8.2.13.2 - Saving and recovery of new parameter settings on USB"**.

7.8 Wi-Fi module port

NOTE! For port location see section "7.1 Location and identification of terminals and LEDs".

The ADL550 and ADL530 series drives are equipped with a dedicated 10-pin connector ( ) for the optional external **Wi-Fi Drive Link** module.

The module enables local wireless communication between the ADL550 and ADL530 series drives and other wireless devices such as smartphones, tablets and PCs and the **WEG Liftouch** App and **WEG_DriveLabs**.

7.9 Connection diagrams

7.9.1 Regulation potentials, digital I/O

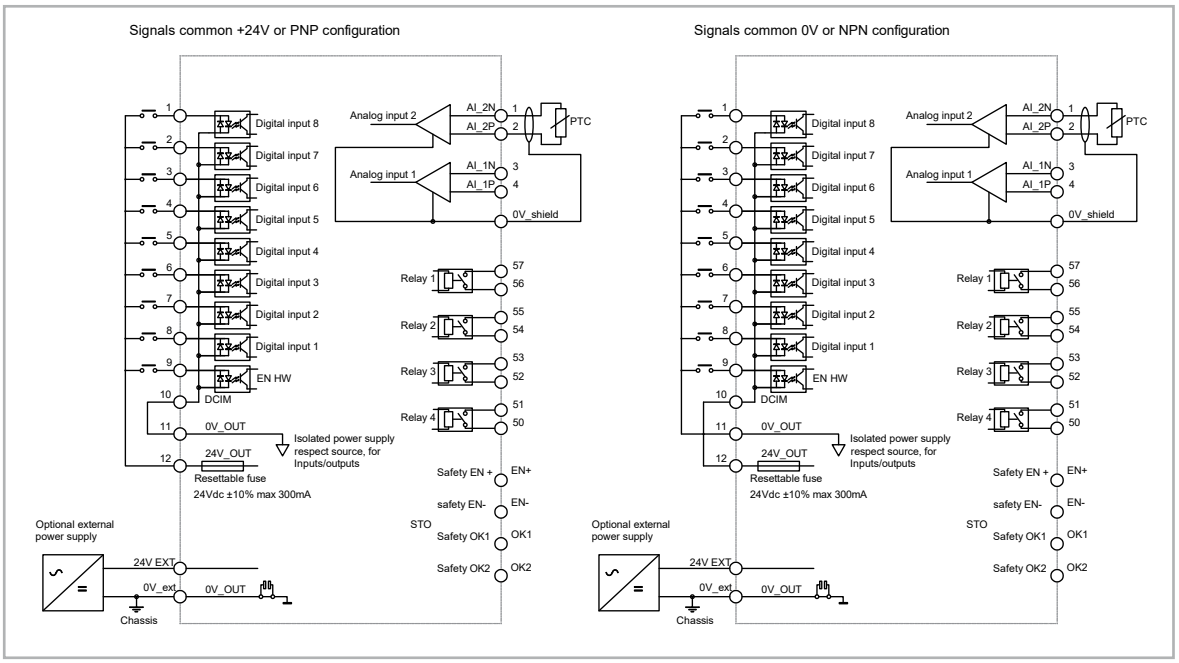


Figure 7.9.1: Regulation potentials

The one in the figure is the recommended circuit that uses the voltages generated internally to the drive to power the digital inputs. If an external power supply is used, make sure that it is adequately isolated from the other voltages present in the control panel and that the ground references are shared.
The internally generated power supply of the digital inputs also allows for correct management of the signal levels during the start-up and shutdown phases.

7.9.2 Typical connection diagram

NOTE! Recommended combination F1 fuses: see chapter "5.1 External fuses".

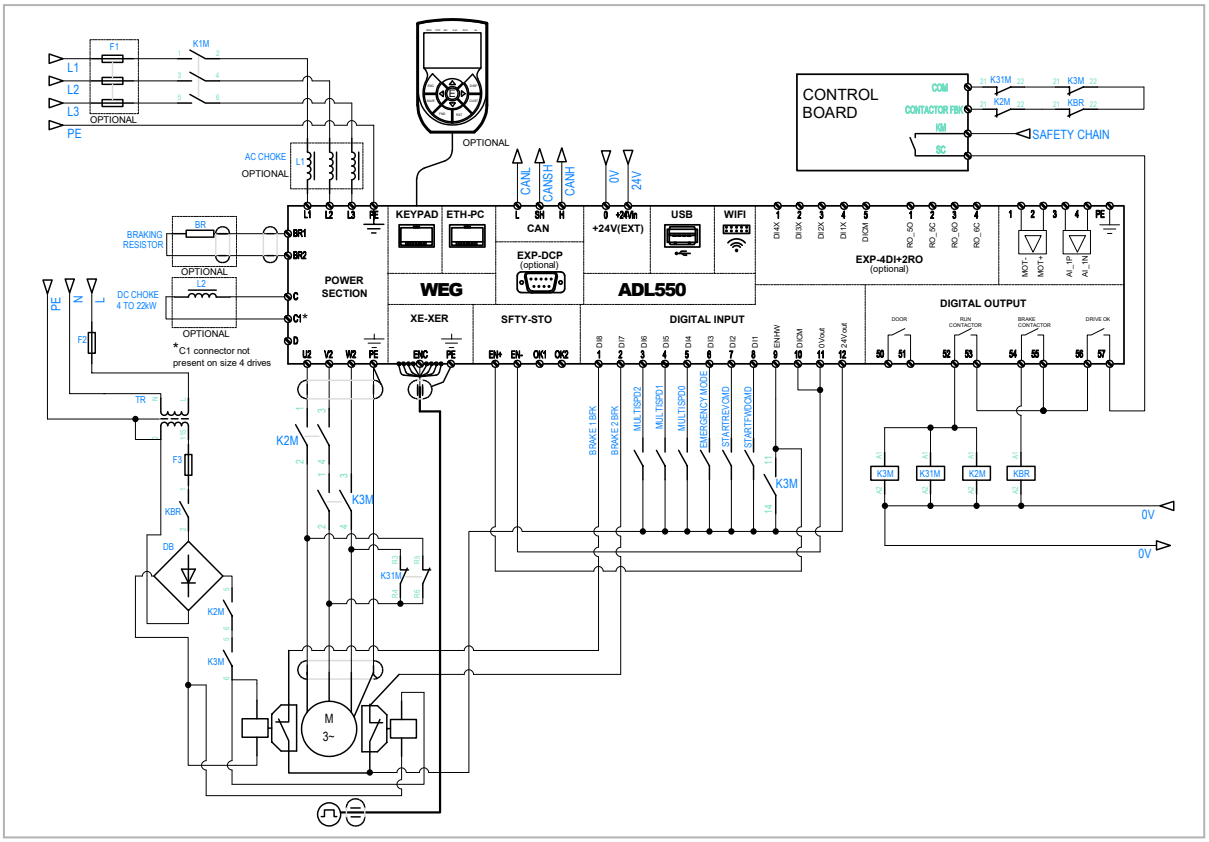


Figure 7.9.2.1: Typical connection diagram (Sizes ADL550-1040 ...4450)

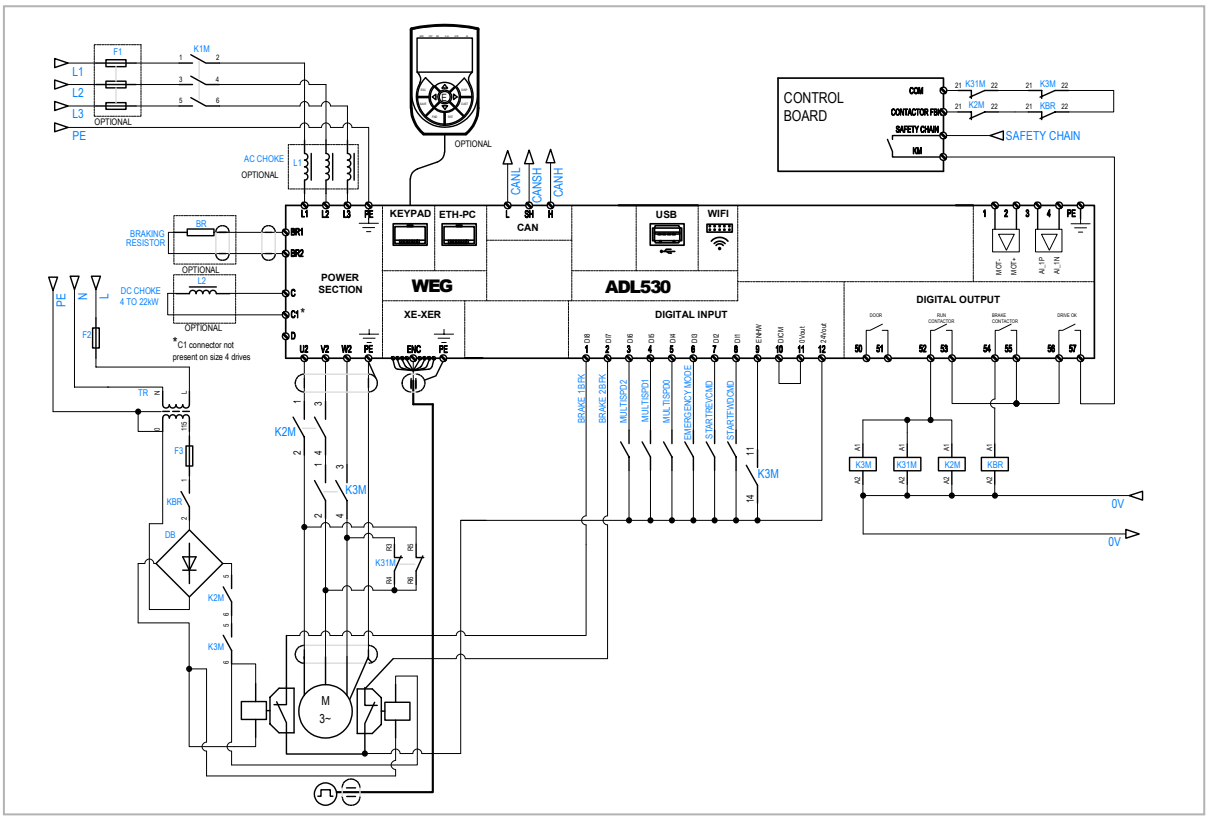


Figure 7.9.2.2: Typical connection diagram (Sizes ADL530-1040 ...4450)

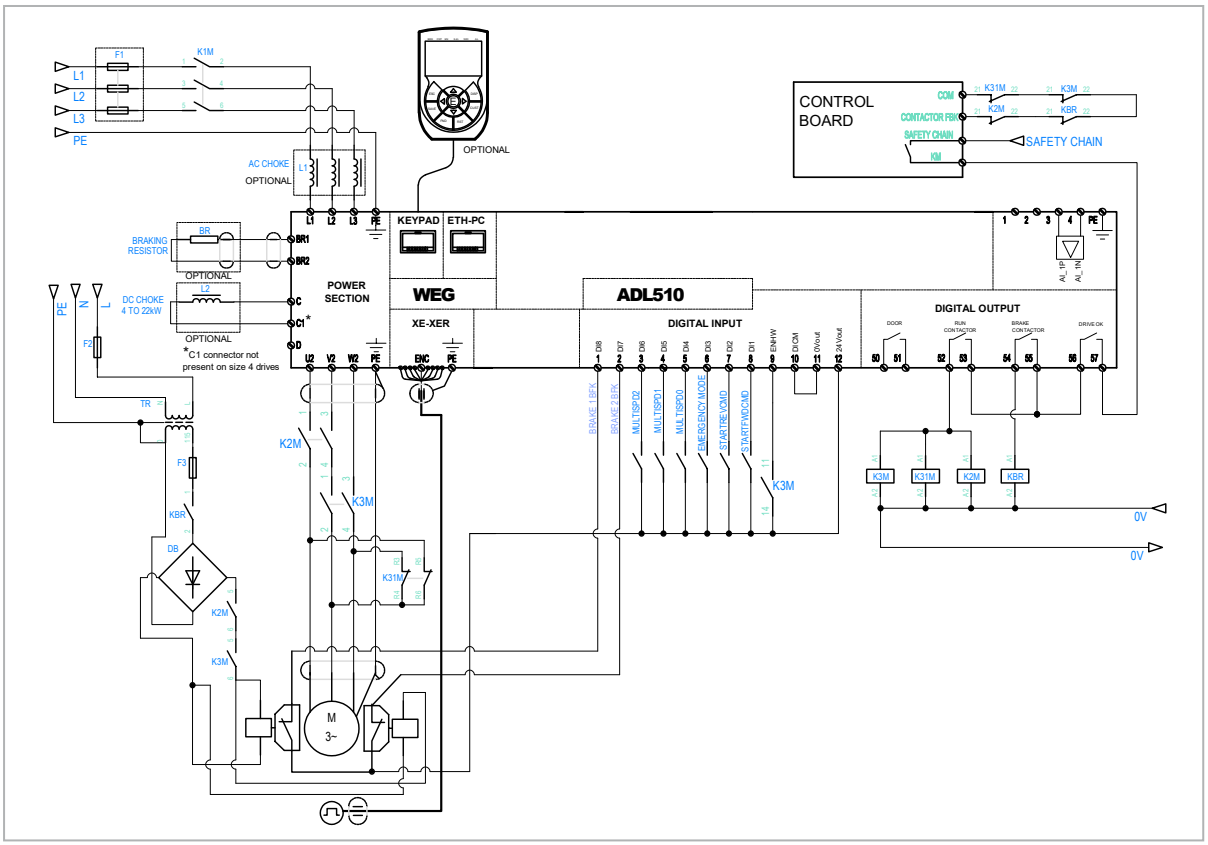


Figure 7.9.2.3: Typical connection diagram (Sizes ADL510-1040 ...3220)

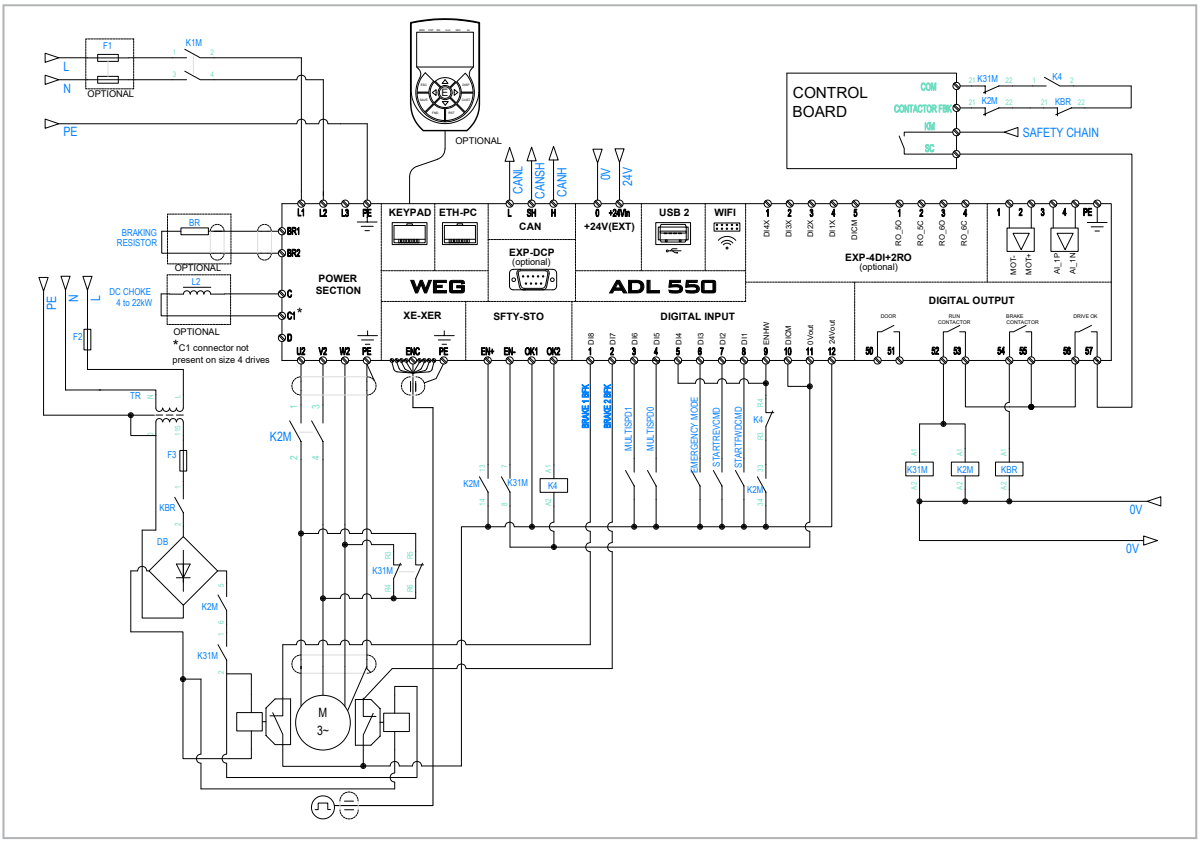


Figure 7.9.2.3-A: Typical diagram with single-phase power supply

7.9.3 Safety connections

Diagram of a lift system conforming to **EN 81-20 5.9.2.5.4 d**, without contactors and with safety function integrated STO (EN 61800-5-2- SIL3).

WARNING!

To use this type of connection reference should be made to the safety and installation instructions in the ADL550 / ADL550-ICS "Safe Torque Off", cod. 1S95STOENW, downloadable from the WEG website (https://www.weg.net).

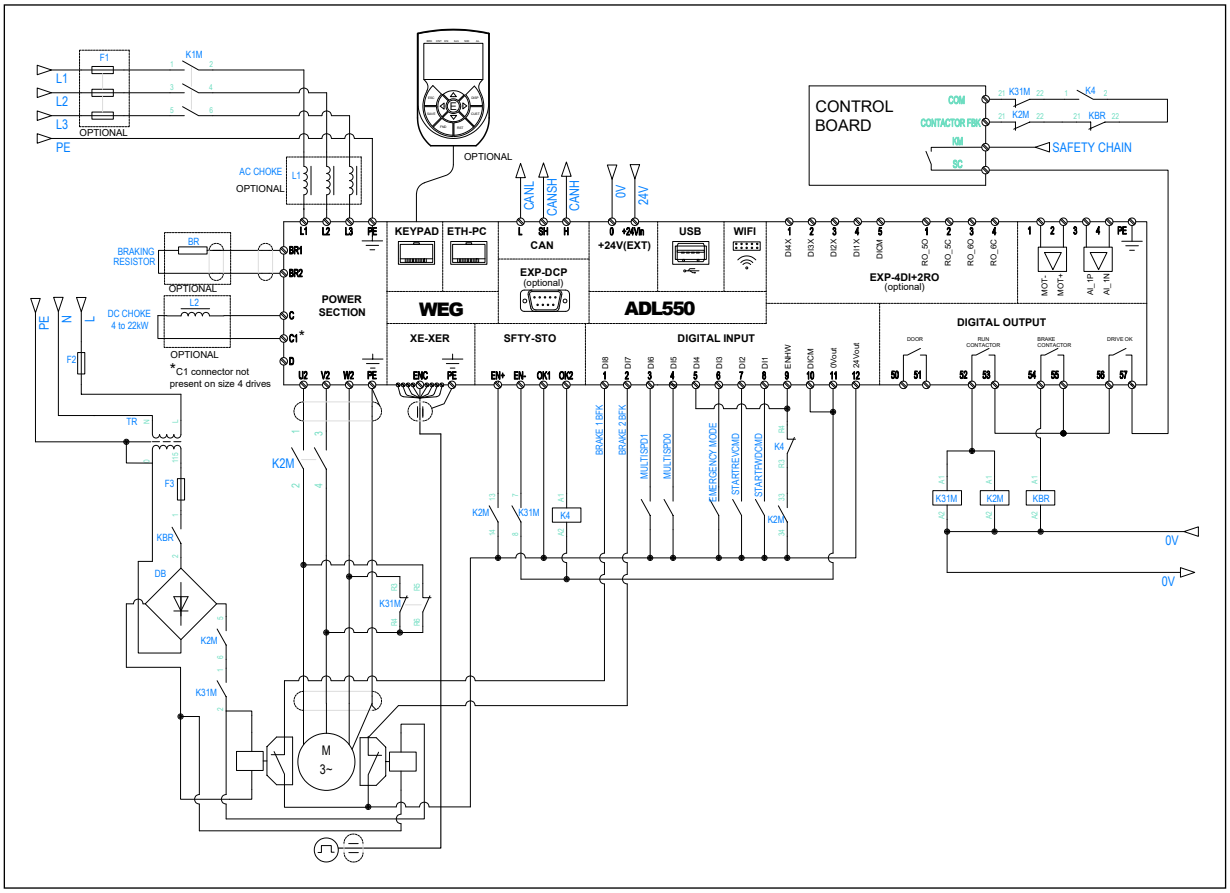


Figure 7.9.3.1: Connections safety for control with a single contactor

Diagram of a lift system compliant with **EN 81-20 5.9.2.5.3 d**, without contactors and integrated safety function STO (EN 61800-5-2- SIL3).

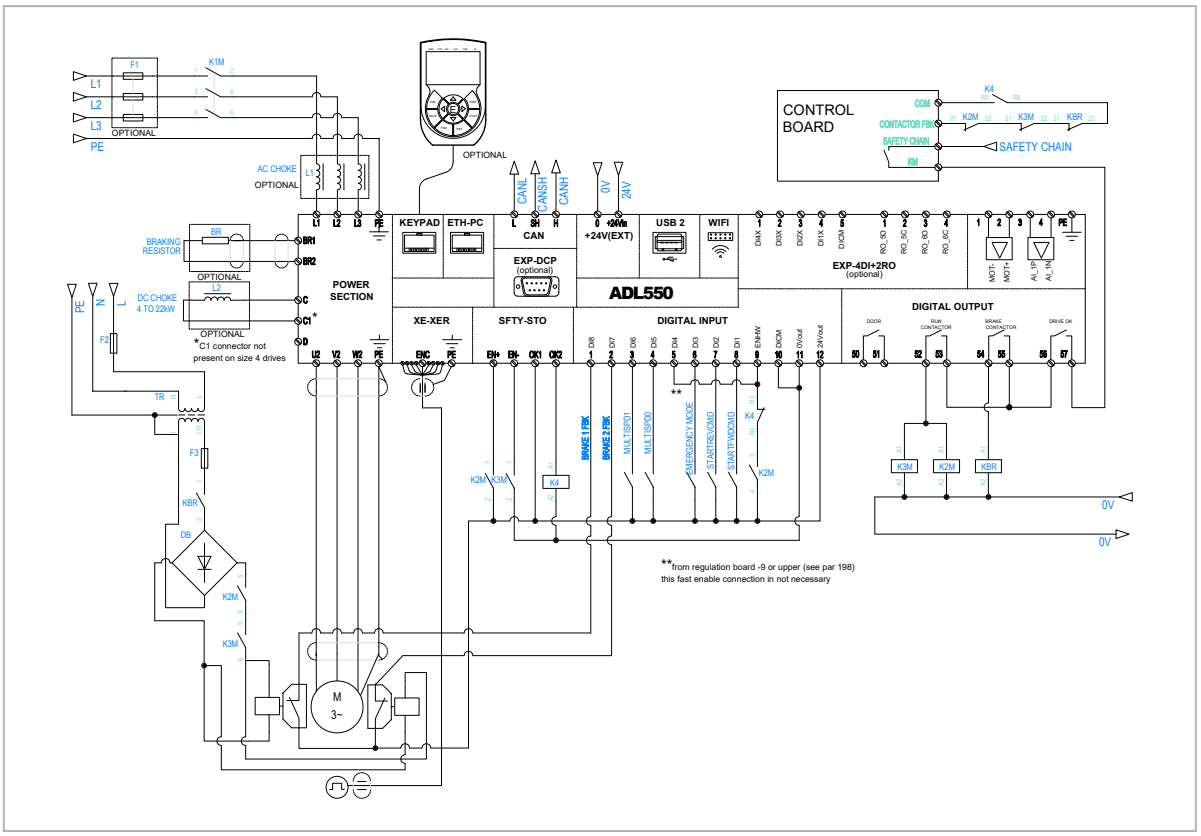


Figure 7.9.3.2-A: Contactorless connection (Asynchronous motor)

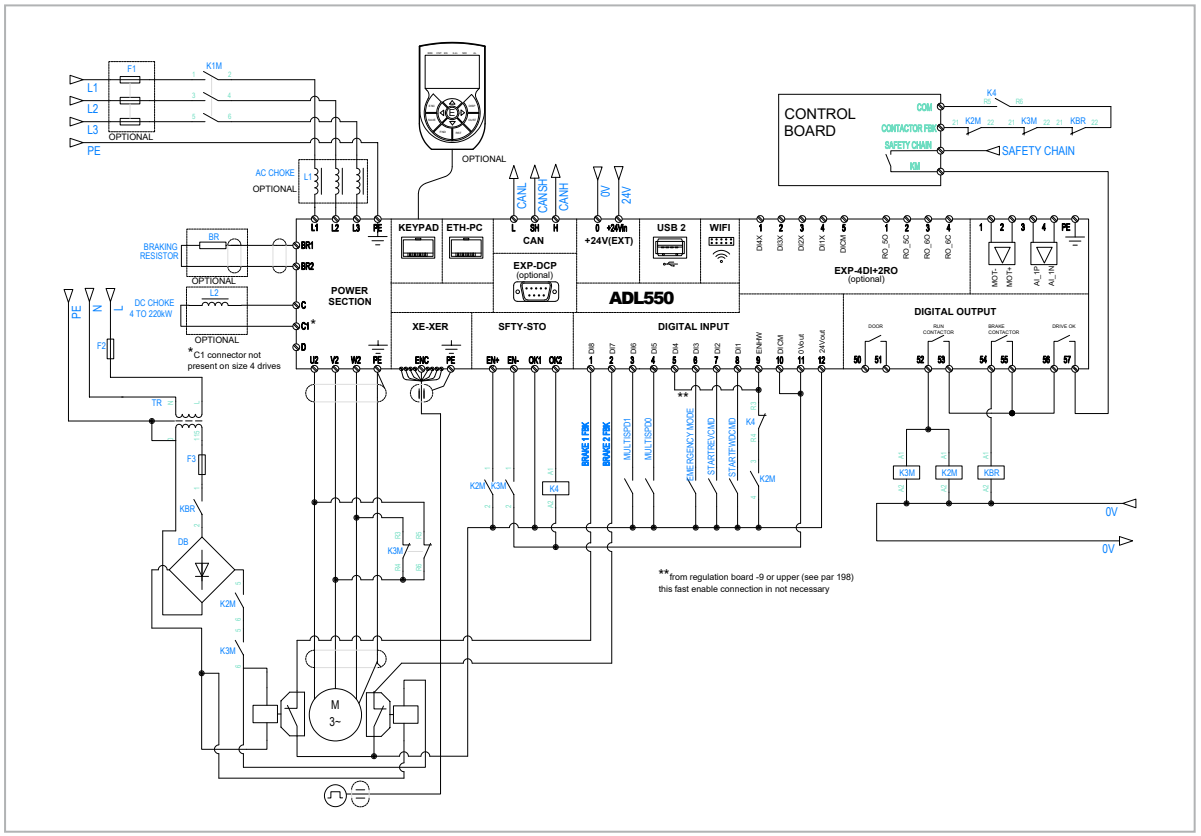


Figure 7.9.3.2-B: Contactorless connection (synchronous motor)

7.10 Emergency and return to the floor maneuvers in case of blackout

The drive allows to manage different types of emergency maneuver (after bypass of safety as instructed by the manufacturer of the control board) or automatic maneuvers to the floor in case of blackout.

The possible emergency maneuver are the fllowing:

- emergency maneuvers with car movement by unbalancing (only possible systems powered by synchronous or asynchronous closed-loop ASY FOC);
- emergency battery saving maneuvers (only possible for systems powered by synchronous or asynchronous closed loop ASY FOC);
- emergency maneuvers by re-energizing the motor;
- combined unbalancing + energizing maneuver.

The possible maneuvers of return to the floor in case of blackout are the following:

- automatic return to the floor by unbalancing (only possible for systems driven by synchronous or asynchronous motors closed loop ASY FOC);
- automatic return to the floor in battery saving mode (only possible for systems driven by synchronous or asynchronous ring motors closed loop ASY FOC);
- automatic return to the floor via UPS or battery pack + EMS module or via UPS or battery mode + UB version.

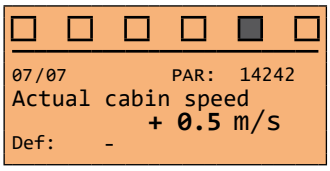
Emergency maneuvers, to be carried out with the man present who bypasses the safety devices, can be carried out due to unbalance without energizing the motor or energizing the motor via the mains or backup power supply type UPS or battery pack + EMS module or by UB version. The discriminant of the type of maneuver is activation of the emergency input and the activation of the unbalance maneuver input activated through the parameter 11820 **Brake opening sel**. If the emergency input due to unbalance is not activated but only the emergency input is activated then, depending on the value set in parameter 11262 **autoselect direction**, commanding a run through the up or down commands, the motor will turn with the modes indicated in the parameter itself with the speed indicated in parameter 11260 **Emergency mode speed**. Usually this type of maneuver is done with the maintenance technician which, having bypassed the safety devices using special circuits, commands a maneuver via the button panel inspection present in the control panel. Activation of the emergency brake activation input has the priority over the emergency maneuver that energizes the motor.

7.10.1 Emergency maneuvers with cabin movement for imbalance

The "dead man" emergency maneuver for SYN FOC gearless or ASY FOC non self-braking geared motors has the following operation.

The purpose of the function is to allow the movement of the car when there is no main power and/or when the safety chain has remained open in order to bring it to the nearest floor by simple gravity.

- The maneuver is possible only when the drive is in emergency condition, commanded by the control board through the digital input "Emergency Mode".
- There must be a digital input, "Digital input Y" in the figure below, which will be connected to a button "**Start emergency maneuver**" of the control board that will enable the movement of the car. The input is configurable with the **Sel brake opening** parameter, PAR 11820.
- When the button is pressed the inverter via the output relay "Brake Contactor" will open the brake contactor. The PAR 11094 parameter set in **Brake + Run** mode allows you to activate also the run contactors that are located along the supply line of the brake coil.
- The operator will press the button to move the cab.
- Using the parameter 11822 **Max vel em** "Max speed manual emergency" you can set the maximum speed that the car (or motor) can have during this maneuver. The speed can be expressed in m/s (if related to the car) or in rpm (if related to the motor).
- If the car reaches the maximum speed allowed the drive locks the brake for a time T configurable by parameter 11824 **Lock time**, disabling the use of the button (even if pressed does not release the brake).
- As soon as you enter the emergency manual maneuver, the display automatically displays the current car speed (or motor if set rpm) and the Fwd or Rev direction through the positive or negative sign indicator.



Since the direction of rotation of the motor in relation to the direction taken by the car depends on the mechanical arrangement of the motor in relation to the ropes and the cab, it is necessary to check during installation what the positive and negative direction indicate and to report it on the specific instructions of the emergency maneuver (For example, if with the + sign of the moving motor the car goes down you must specify that the + sign is equivalent to the car going down).

- This maneuver must be disabled in case of inspection.

The car will move (Brake Contactor = Open) only in the following conditions:

- **Emergency Mode**: ON (Contactor Closed)
- **Brake release src**: ON (Contactor Closed)
- **Emergency Manual V**: < Em max speed
- **Contactor Lock Time** = 0

ATTENTION!

This emergency manoeuvre, performed as outlined in chapter 5.12.1.6 of EN 81-20, requires that the other contactors, those in series with the contactor actuated by the drive brake contactor output, be activated either by the value Brake + Run in parameter 11094 or they must be bypassed following the safety specifications given in that chapter and in chapter 5.11.2 (Electrical safety devices); if not, the brake power supply circuit will not close and the brake cannot be opened electronically.

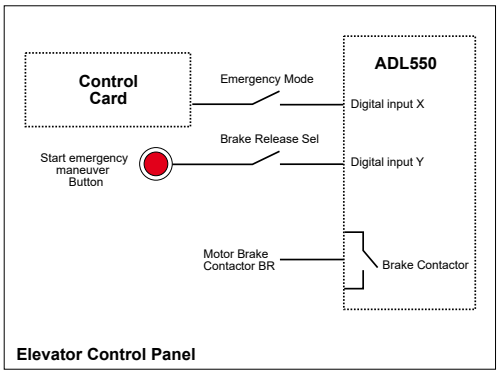


Figure 7.10.1.1: Diagram of main emergency maneuver

7.10.2 Emergency maneuvers with battery saving

For the description of this maneuver refer to paragraph 7.10.5 taking into account that with respect to the automatic maneuver you need the presence of the maintainer that bypasses the safety chain and that controls the maneuver by dead man commands.

7.10.3 Emergency maneuvers by energizing the motor

For the description of this maneuver, refer to paragraphs 7.10.6 or 7.10.7, taking into account that the automatic maneuver requires the presence of the maintainer that bypasses the safety chain and controls the maneuver by dead man commands.

7.10.4 Maneuver of return to the floor for imbalance in case of blackout

The ASY FOC maneuver for unbalance in the event of a power outage for gearless or non self-braking closed loop ASY FOC motors has the same operation as the emergency maneuver for imbalance with tecnician on site that launch dead man commands with the difference that, If the safety chain remains closed, the movement control by imbalance via the "Digital Input Y" input can be automatically given by the elevator control board.
In this case, as an alternative to the digital input "input Y" the command can be activated by simultaneous activation of the inputs frw and rev after setting the parameter 11820 **Sel brake opening** to the value FWD+REV.
The inbalanced mode takes precedence over the battery save mode in the sense that if I activate a digital input as brake release button (imbalancing move command), if this input is active in addition to the emergency input set with the battery-save mode, the unlocking feature takes precedence and the inbalance function is performed (with or without activation of the contactors output depending on the parameter 11094 **Brake release type**).

7.10.5 Maneuver of return to the floor battery saving in case of blackout

The principle of operation of the function of return to the floor in case of a power outage with battery saving works as follows: with emergency input activated the drive tries to move the motor (gearless or non self-braking closed-loop ASY FOC gears) using only the imbalance as for a maneuver for inbalance that opens only the brake (and eventually also the run contactors by setting the parameter PAR 11094 **Brake release type** in "Brake + Run" mode), if within a preset time from PAR 11092 **Em min spd time** the car moves beyond the minimum speed set with the parameter 11090 **Em min speed** then the car continues the ride until it reaches the floor or until it reaches the maximum speed setted in emergency set parameter 11822 **Max vel em**; the attainment of this speed involves the immediate stop of the drive with reopening of the contactors and the consequent waiting of the time 11824 **Block time** before it is automatically recalled, by the drive, the brake reopening (the emergency control must always remain active). If by the time 11092 the car does not reach this speed the maneuver for imbalance is interrupted and then continue with the motor powered.

ATTENTION!

The parameter 11824 **Lock time**, which defines the waiting time when the brake is pressed between the release of the brake for reached maximum speed in emergency and the subsequent closing of the brake, must be less than 11092 **Min vel time** otherwise the maneuver turns into energized maneuver. The speed of the cabin com motor powered is determined by the parameter 11014 **Em max speed Sav bat**.

In the case of selection "**Battery saving**" the direction that takes the motor is indicated by theinputs upward or downward. In the case of selection "**Batterysave+Rec**" the direction taken by the motor is independent of the enabled input up or down and follows the reccomended direction previously stored in the drive. Summing up, in this maneuver first the emergency input must be activated, then the control board must command a movement of ascent or descent also enabling the enable as a normal maneuver (except that multispeed inputs that are not considered and the motor speed is adjusted by parameter 11260), then the car will move for imbalance or in the way with energized motor.

Once the cabin has reached the floor, is the control board that controls the motor stop by removing the up or down input and then the enable input.

7.10.6 Return to the floor in case of blackout with EMS module (ADL5.0-...-EMS models) or with UB version (ADL5.0-...-UB models)

In the event of a three-phase power failure, the system manages the movement of the motor in an emergency condition via an external battery connected to the built-in EMS module in the ADL510/530/550-...-EMS models or via an external battery connected between inputs C and D and a voltage of 270 Vdc±10% between inputs AUX+ and AUX- in the ADL510/530/550-...-UB size 1, 2 and 3 models and between inputs AUX+ and D in the ADL510/530/550-...-UB size 4 models. With the EMS module, the KE battery contactor can remain closed at all times to reduce the shutdown time of the car. Its main use is to preserve the battery after the emergency maneuver is completed. With the UB version, the KE battery contactor MUST remain open during normal operation and must be interlocked with the K1M contactor. The UB inputs (AUX+ and AUX- o D) can remain closed at all times or it can also be opened by the KE contactor; again KE can be reopened after the emergency manoeuvre is completed to preserve the battery pack.

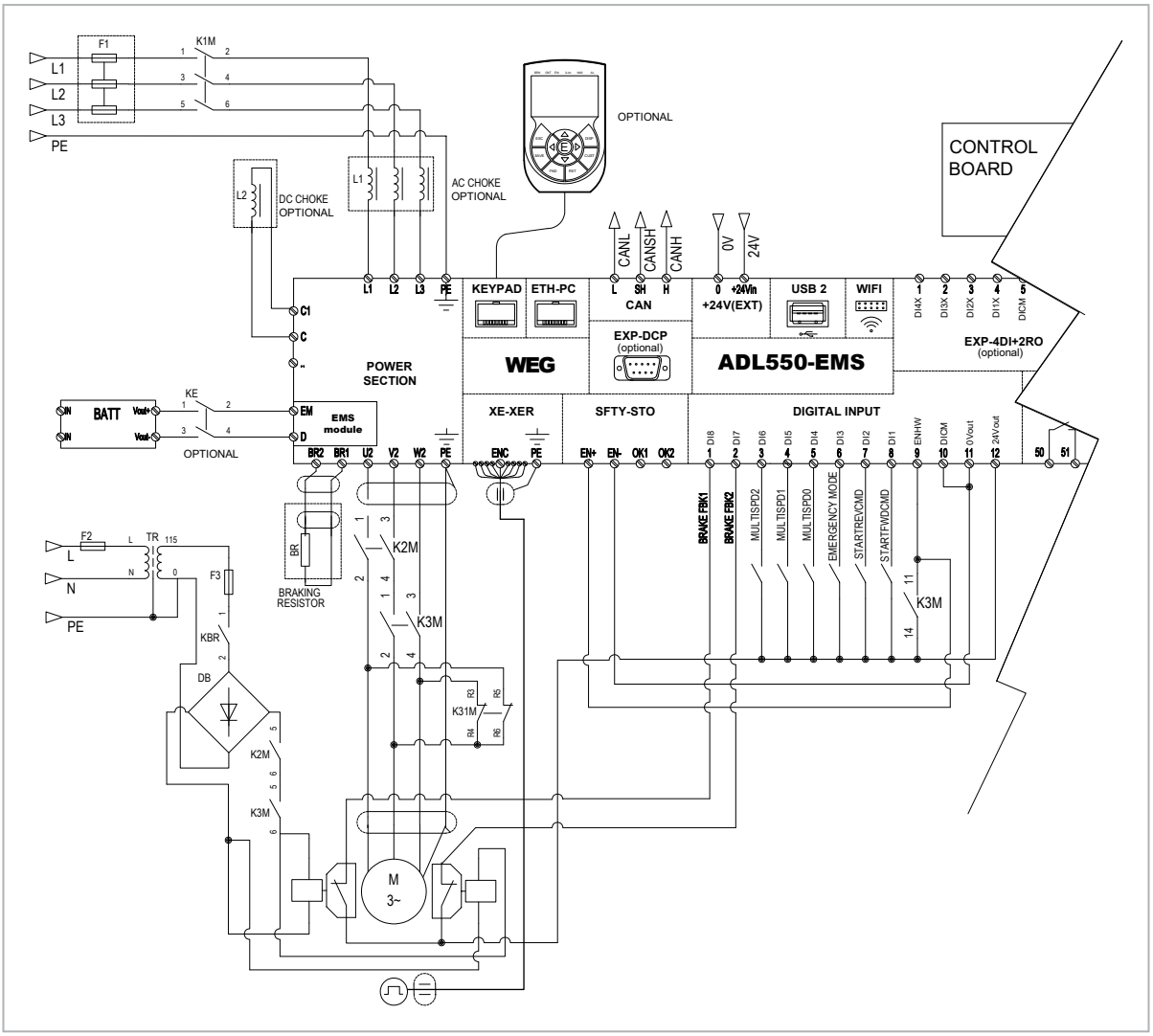


Figure 7.10.6.1 Diagram emergency connection with EMS (Size 1 and 2) module

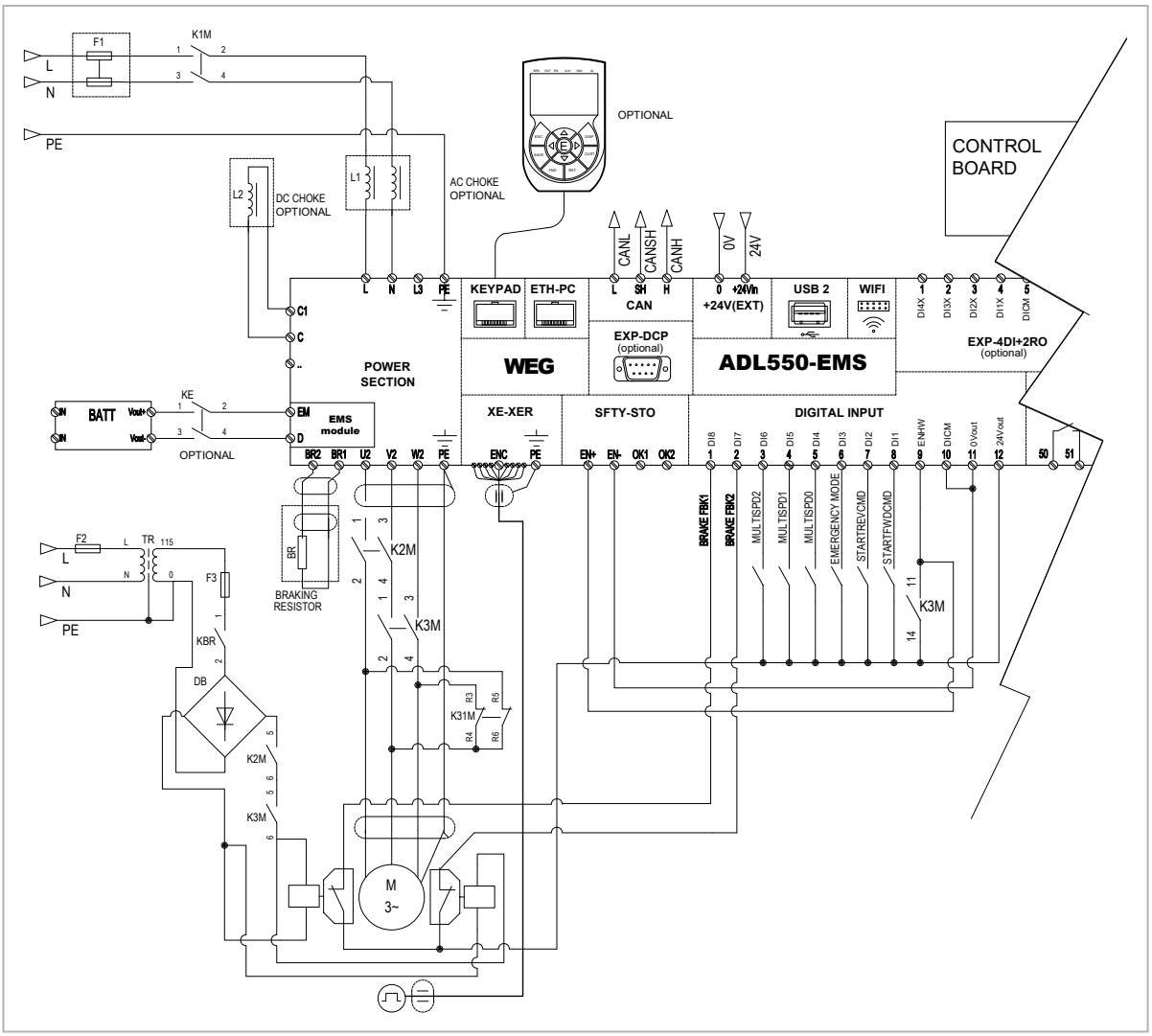
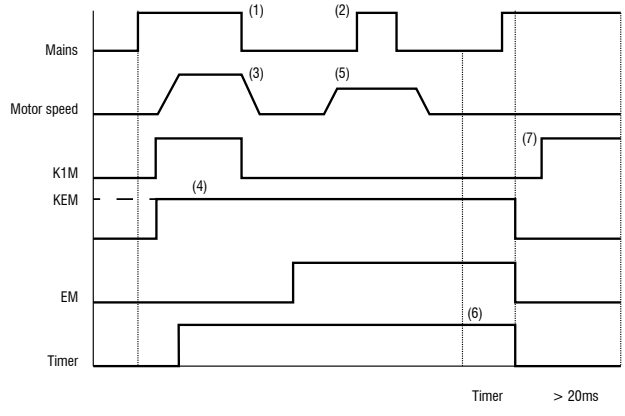


Figure 7.10.6.1-A: Emergency connection diagram with single-phase (2M) EMS (size 1 and 2) module



1) Power supply is interrupted, drive signals **Under voltage**.

2) Power can be restored at any time while driving, but the drive is separated from the network by K1M.

3) The motor is braked.

4) After the main power supply is removed, the drive detects the presence of the battery and remains in standby until the EM input is activated.

5) The D-EM input (of the Emergency Mode Supply module) is enabled and Running commands are given. A very low speed must be set (menu 5.9.2 PAR 11260 **Emergency speed**). The cabin is brought to the plane. The Undervoltage alarm is ignored.

6) After the drive is finished, a meter keeps the drive active for a preset time after which it deactivates the emergency relay coil, allowing the system to turn off and save batteries.

7) The K1M relay must be closed at least 200ms after the EM input is disabled.

7.10.7 Automatic return to floor maneuver in case of blackout with UPS

In the event of a three-phase power supply failure, the system manages the movement of the motor in an emergency condition via the 230Vac single-phase power supply from the UPS. UPS asks that care be taken when designing/selecting the power supply circuit/device via UPS because, from the main power supply, voltages may be returned which could damage the circuit components. The time requirements, which the circuit designer must meet, are shown in the diagram below.

The UPS must be correctly sized to guarantee a nominal voltage of 230Vac (with the usual mains tolerances) during the emergency phase.
With this connection, the EM terminal, if present on the power terminal block, will not be used.

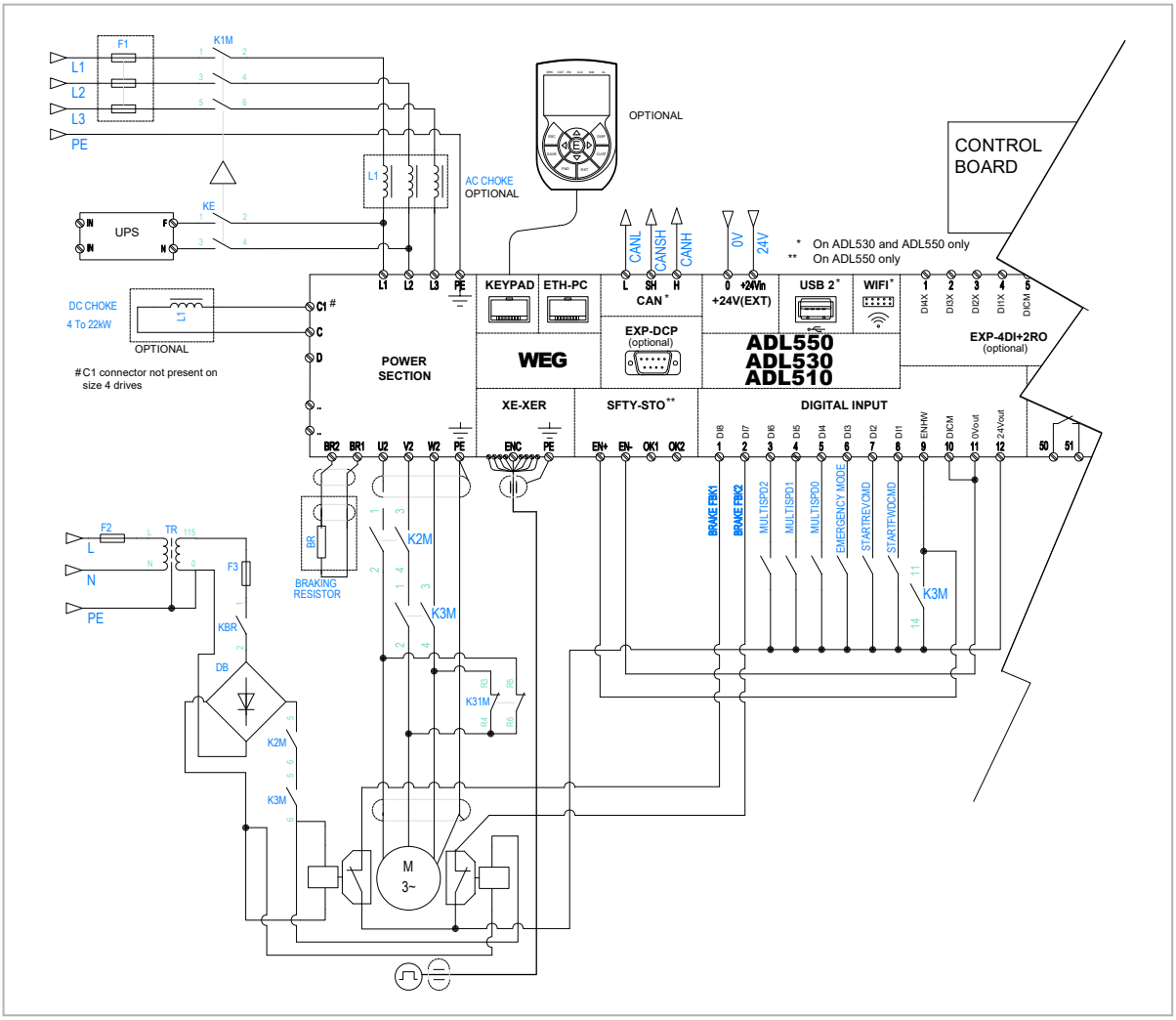


Figure 7.10.7.1: Emergency connection diagram from UPS device

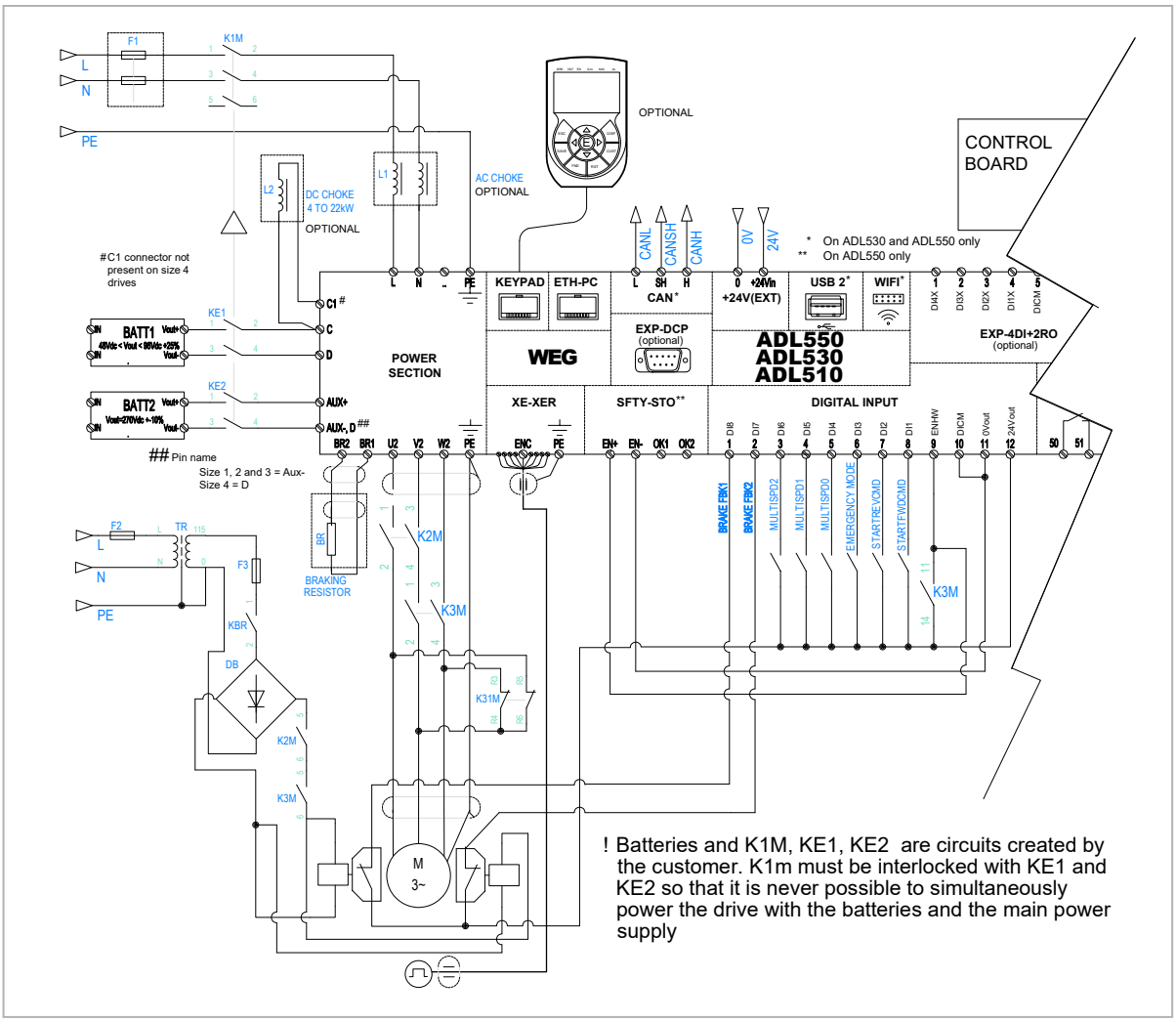
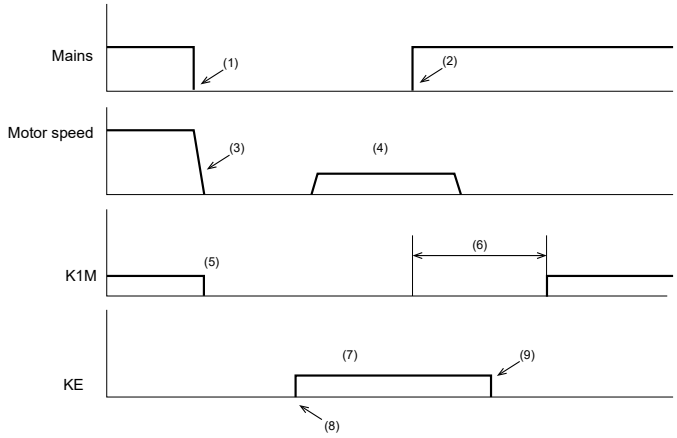


Figure 7.10.7.1-A: Emergency connection diagram from single-phase UPS device



(1) Power supply is interrupted, drive signals **Under voltage.**
(2) Power can be restored at any time while driving, but the drive is separated from the network by K1M.
(3) The motor is braked.
(4) The commands **Forward or Reverse** are given. A very low speed must be set (menu 5.9.2, PAR 11260 **Emergency speed**). The cabin is brought to the floor. The **Undervoltage** alarm is ignored.
(5) The drive must be turned off or the drive output OK, which opens by mistake **Undervoltage** must, by means of an interchange relay, interlock the coil of the contactor KE (in practice you must make sure that the preload circuit inside the drive has reopened). The K1M contactor must be OFF.
(6) The drive must be turned off. K1M must be OFF.
(7) Bring KE=ON, power is provided by UPS. While KE is ON the contact logic must ensure that K1M=OFF.
(8) KE can be brought to ON status, with a delay, manually or automatically via network failure verification devices and by using the OK drive output.
(9) At the end of the sequence KE must be OFF.

7.11 Braking

There are several braking options:

- by internal braking unit combined with an external braking resistance Rbr;
- by injection of direct current into the motor by the inverter (DC braking).

The two possibilities present these fundamental differences:

- With a braking unit combined with an external bracking resistance it is possible to obtain an intermediate braking (for example from 1000 to 800 rev/min) while the DC braking is only usable to stop the motor up to zero speed.
- The energy found in the drive is transformed into heat in both cases: with the use of a braking unit is dissipated on an external resistance, while for DC braking occurs in the form of transformation into heat in the motor windings (additional heating of the motor).

7.11.1 Braking unit (internal)

Frequency-regulated asynchronous motors during hyper-synchronous or regenerative functioning behave as generators, recovering energy that flows through the inverter bridge, in the intermediate circuit as continuous current.
This leads to an increase in the intermediate circuit voltage.
Braking units (BU) are therefore used in order to prevent the DC voltage rising to an impermissible value. When used, these activate a braking resistor that is connected in parallel to the capacitors of the intermediate circuit. The feedback energy is converted to heat via the braking resistor (RBR), thus providing very short deceleration times and restricted four-quadrant operation.

In the standard configuration, ADL drives (≤ 55kW) comprise an internal braking unit.

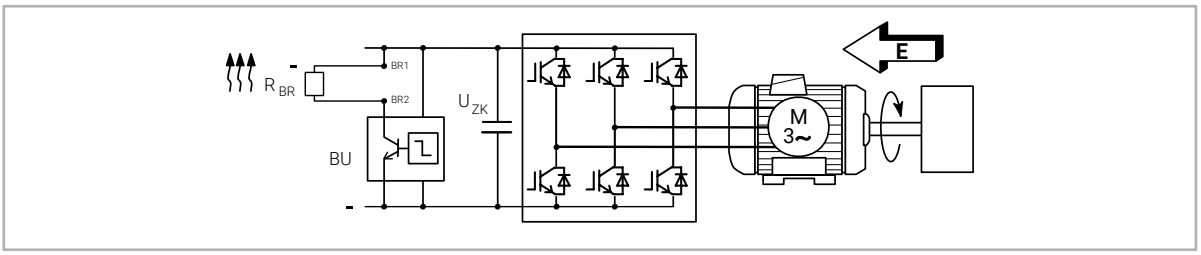


Figure 7.11.1.1: Operation with braking unit (circuit diagram)

NOTE! When the internal braking unit is present the protection must consist of fast-acting fuses! Follow the relative assembly instructions.

A twisted or shielded cable must be used for the connection of the braking resistor (terminals BR1 and BR2). If the resistor includes a thermal protection device (Klixon), this must be connected to the "External fault" input of the drive.

Size	IRMS [A]	IPK [A]	RBR [Ω]
ADL5XX-...-4, 3ph			
1040	8.3	11.8	68
1055	8.3	11.8	68
1075	11.5	16.3	49
2110	20.2	28.5	28
2150	20.2	28.5	28
3185	37.7	53.3	15
3220	37.7	53.3	15
4300	57	80	10
4370	57	80	10
4450	76	107	7.5

Size	IRMS [A]	IPK [A]	RBR [Ω]
ADL5XX-...-2T, 3ph			
2055	15.5	21.9	18
2075	15.5	21.9	18
3011	23.2	32.8	12

Size	I_{RMS} [A]	I_{PK} [A]	R_{BR} [Ω]
4150	57	80	10.1
4185	57	80	10.1
4220	76	107	7.5

Size	I_{RMS} [A]	I_{PK} [A]	R_{BR} [Ω]
ADL5XX-...-2M, 1ph			
1011	4.1	5.8	68
1015	4.1	5.8	68
2022	5.7	8.0	49
2030	10.0	14.1	28
3185	18.6	26.3	15
3220	18.6	26.3	15

Table 7.11.1.2: Technical data of the internal braking unit

I_{RMS} Braking unit rated current, duty cycle = 50%.
I_{PK} Peak current that can be delivered for max 60 seconds.
R_{BR} Minimum braking resistance value.

Size	V_{BR} @ 480V		V_{BR} @ 460V		V_{BR} @ 400V		V_{BR} @ 230V	
	ON	OFF	ON	OFF	ON	OFF	ON	OFF
ADL5XX-...-4, 3ph								
1040 ... 4450	800 Vdc	790 Vdc	768 Vdc	758 Vdc	670 Vdc	660 Vdc	394 Vdc	384 Vdc

Table 7.11.1.2: Braking unit intervention threshold

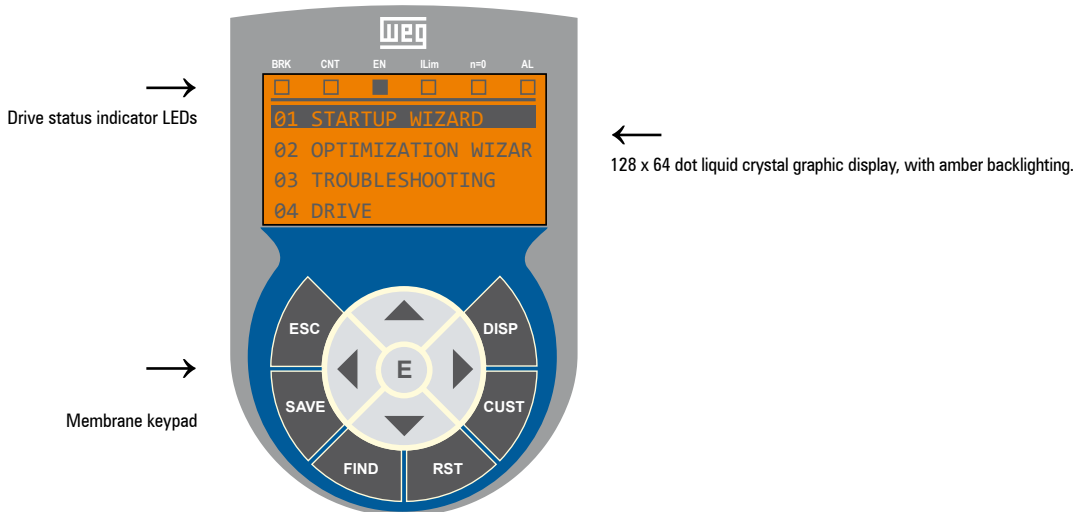
NOTE! For the combination of recommended braking resistors refer to chapter **"5.4 External braking resistors".**

8. Use of the optional keypad (KB-ADL500)

This section describes the optional KB-ADL500 programming keypad (cod. S5P11T) and how to use it (display and programming parameters).

NOTE! For the connection refer to section "7.6 Optional Keypad interface (RJ45 connector)".

8.1 Description



8.1.1 Membrane keypad

This section describes the keys on the membrane keypad and their functions.

Symbol	Reference	Description
ESC	Escape	Returns to the higher level menu or submenu. Exits a parameter, a list of parameters, the list of the last 10 parameters and the FIND function. Can be used to exit a message that requires use of this.
SAVE	Save	Saves the parameters directly in the non-volatile memory without having to use PAR 550 **Save parameters.** Saving is done by pressing the SAVE button and then, when prompted on the display, the OK button.
FIND	Find	Enables the function for accessing a parameter using its number. To exit these functions, press the ◀ key.
RST	Reset	Resets alarms, only if the causes have been eliminated.
CUST	Custom	Displays the last 10 parameters that have been modified. To exit these functions, press the ◀ key.
DISP	Display	Displays a list of drive functioning parameters.
E	Enter	Enters the submenu or selected parameter, or selects an operation. It is used when modifying parameters to confirm the new value that has been set.
▲	Up	Moves the selection up in a menu or list of parameters. During modification of a parameter, increases the value of the digit under the cursor.
▼	Down	Moves the selection down in a menu or list of parameters. During modification of a parameter, decreases the value of the digit under the cursor.
◀	Left	Returns to the higher level menu. During modification of a parameter, moves the cursor to the left.
▶	Right	Accesses the submenu or parameter selected. During modification of a parameter, moves the cursor to the right.

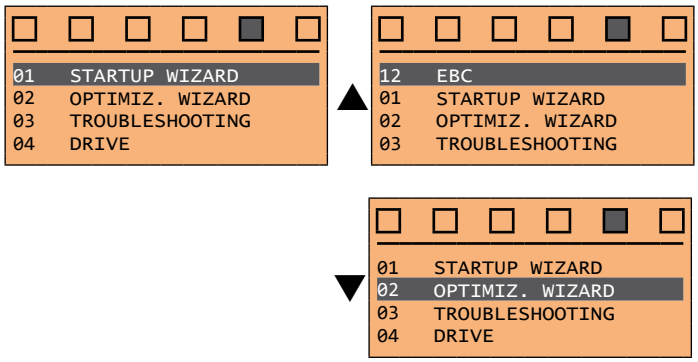
8.1.2 Meaning of LEDs

LEDs	Meaning of LEDs
BRK	The LED is lit when the drive has activated the brake release command
CNT	The LED is lit when the drive has activated the close contactors command
EN	The LED is lit during IGBT modulation (drive operating)
ILIM	When this LED is lit the drive has reached a current limit condition. During normal functioning, this LED is off.
N=0	The LED is lit when motor speed is 0.
AL	The LED is lit when the drive signals that an alarm has been triggered

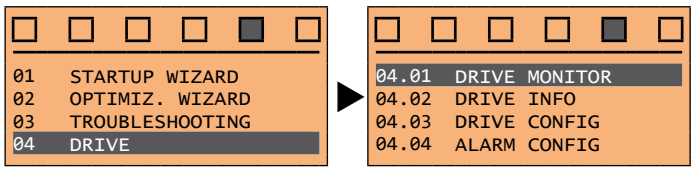
8.2 Navigating with the optional keypad

8.2.1 Scanning of the first and second level menu

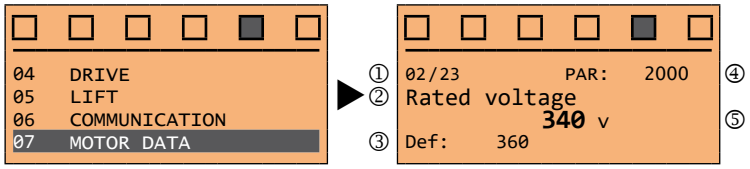
First level



First level Second level



8.2.2 Display of a parameter



(1) Reference to the menu where the parameter is to be found, in this case menu MOTOR DATA (02/30)

(2) Description of the parameter (**Rated voltage**)

(3) Depends on the type of parameter:

- Numeric parameter: displays the numeric value of the parameter, in the format required, and unit of measurement. Attention, the configurator WEG_DriveLabs displays only the initial default values not related to the type of motor that are in Hz even if the speed display mode is set to m/s. keypad report default value related to selected speed measurement unit.
- Binary selection: the parameter may assume only 2 states, indicated as **On - Off** or 0 - 1.
- LINK type parameter: displays the description of the parameter set from the selection list.
- ENUM type parameter: displays the description of the selection
- Command: displays the method of execution of the command

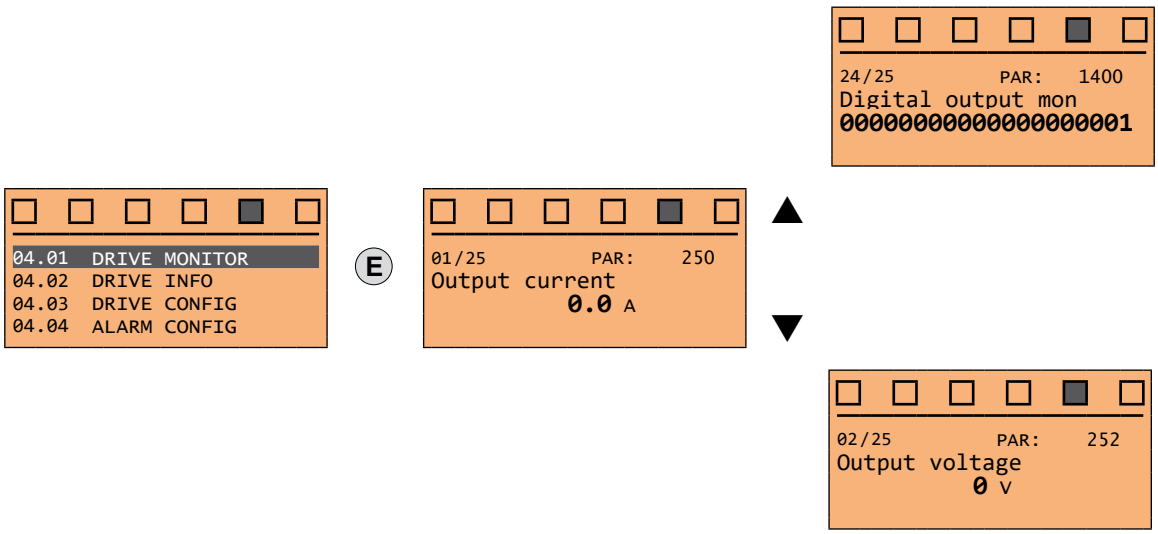
(4) Parameter number

(5) In this position, the following may be displayed:

- Numeric parameter: displays the default, minimum and maximum values of the parameter. These values are displayed in sequence pressing the ► key.
- LINK type parameter: displays the number (PAR) of the parameter set.
- ENUM type parameter: displays the numeric value corresponding to the current selection.
- Command: in the case of an error in the command, indicates that **ESC** must be pressed to terminate the command.
- Messages and error conditions:

Param read only	attempt to modify a read-only parameter
Drive enabled	attempt to modify a non-modifiable parameter with the drive enabled
Input value too high	the value entered too high
Input value too low	the value entered too low
Out of range	attempt to insert a value outside the min. and max. limits

8.2.3 Scanning of the parameters



8.2.4 List of the last parameters modified

Pressing the **CUST** key, a list containing the last 10 parameters modified is accessed. One parameter is displayed at a time and the list can be scrolled using the ▲ and ▼ keys.
To exit this list, press the ► key.

8.2.5 "FIND" function

Pressing the **FIND** key activates the function that makes it possible to access any parameter simply by entering the parameter software number (PAR).
When the parameter reached by the "**FIND**" command is displayed, it is possible to navigate all the parameters forming part of the same group using the ▲ and ▼ keys. Pressing the ◄ key returns to the "**FIND**" function.
To exit, press the **ESC** key.

8.2.6 Parameter modification

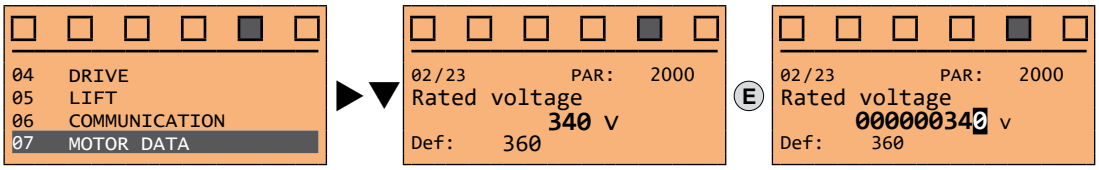
To enter parameter modification mode, press the **E** key when the parameter to be modified is displayed.
To save the value of the parameter, following modification, press the **E** key again.

NOTE! To save permanently, **see paragraph 8.2.7**.

To exit modification mode without saving the value, press the **ESC** key.
The operations to be carried out to modify the value depend on the type of the parameter, as described below.

NOTE! For further information about the type of parameters displayed, **see paragraph 8.2.2**.

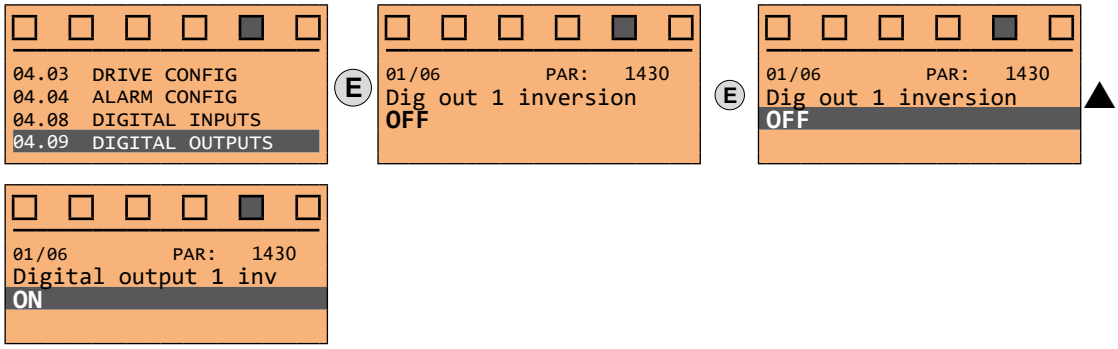
- **Numeric parameters**



When **E** is pressed to access modification mode, the cursor is activated on the digit corresponding to the unit.
Using the ◄ and ► keys, the cursor can be moved to all the digits, including trailing zeros that are normally not displayed.
With the ▲ and ▼ keys, the digit under the cursor is increased or decreased.
Press **E** to confirm the modification or **ESC** to cancel.

- **Binary parameters (BIT type)**

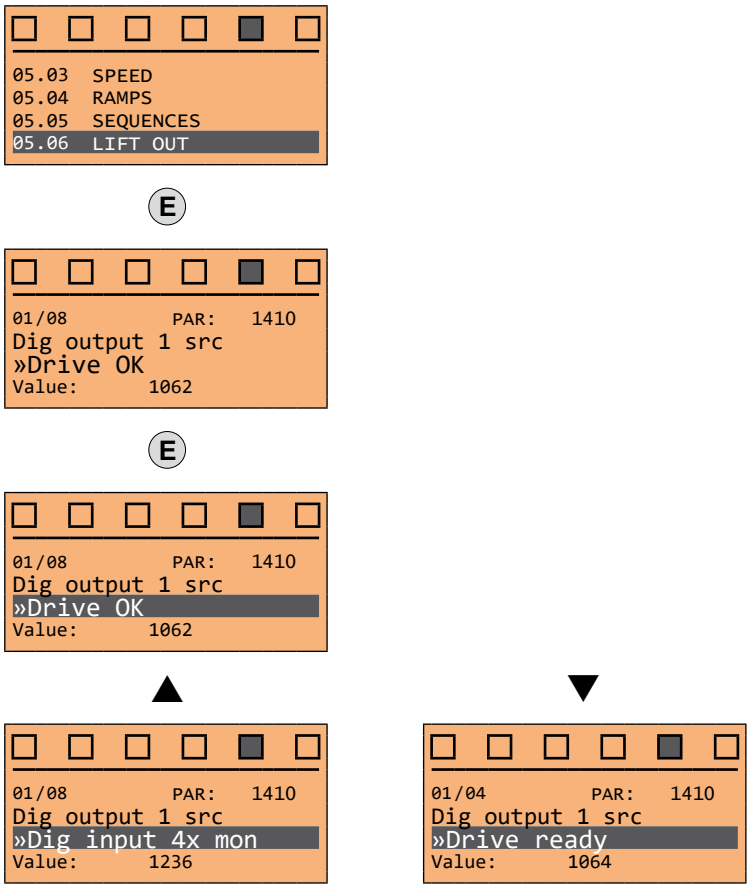
The parameter may assume only two states which are indicated as **On**-**Off** or 0-1.



Press **E** to activate modification mode. The entire line is displayed in reverse. Use the ▲ and ▼ keys to move from one state to another. Press **E** to confirm the modification or **ESC** to cancel.

- **LINK parameters**

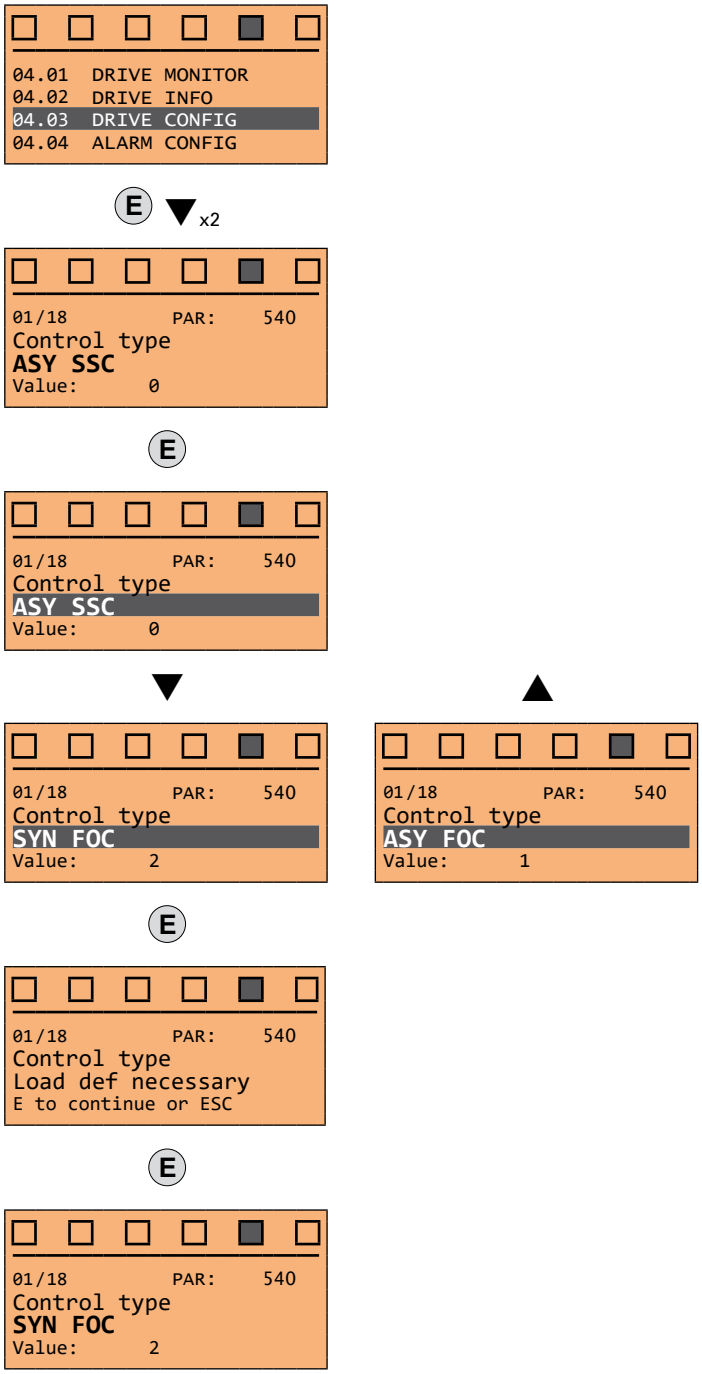
The parameter may assume the number of another parameter as value.



Press **E** to activate modification mode. The entire line is displayed in reverse. The elements of the list of parameters associated with this parameter can be scrolled using the ▲ and ▼ keys.
Press **E** to confirm the modification or **ESC** to cancel.

- **ENUM parameters**

The parameter may assume only the values contained in a selection list.



Press **E** to activate modification mode. The entire line is displayed in reverse.
The elements of the selection list can be scrolled using the ▲ and ▼ keys.
Press **E** to confirm the modification or **ESC** to cancel.

NOTE!

Only for Control type parameter is required one double check command for be sure that change of type of motor is intended because changing from asy to sym motor or from syn to asy motor an auto procedure of new load default parameter is automatically implemented. doubleheck avoid some input error that may require to reinstall previous parameter. Changing from ASY SSC to ASY FOC or from ASY FOC to ASY SSCc double chech is not required because default parameter is not required by drive.

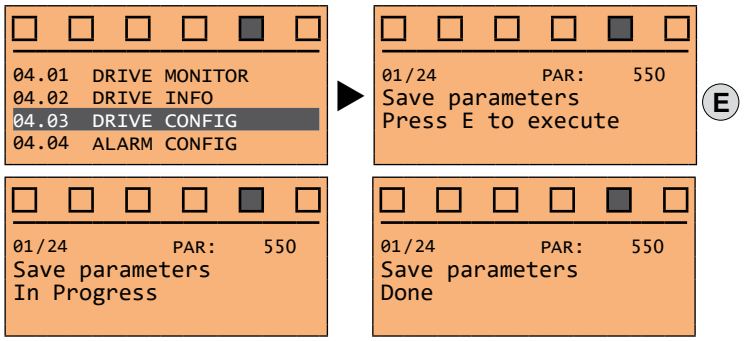
- **Execution of commands**

A parameter can be used to carry out a number of operations on the drive. For an example, see next paragraph: in this case the request "**Press E to execute**" is displayed.
To execute the command, press **E**. During execution of the command, the "**In progress**" caption is displayed to indicate that the operation is in course. At the end of execution, if the result is positive, the "**Done**" caption is displayed for few seconds. If execution has failed, an error message is displayed.

8.2.7 How to save parameters

There are two ways of saving parameters in the non-volatile memory of the drive:

1) By pressing the **SAVE** key on the keypad.
2) Menu DRIVE CONFIG, parameter **Save parameters**, PAR : 550. This is used to save changes to parameter settings so that they are maintained even after power-off.

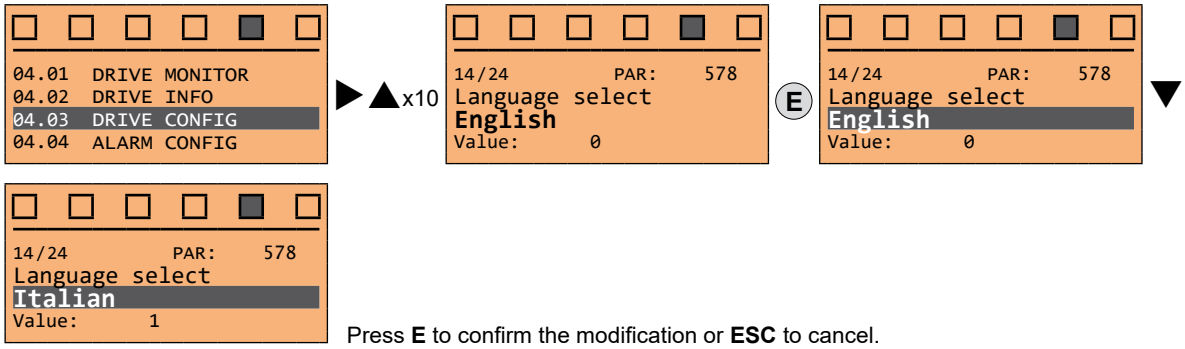


To exit, press the ◄ key.

8.2.8 Configuration of the display

8.2.8.1 Language selection

Menu DRIVE CONFIG, parameter 04.19 **Language select**, PAR: 578, default=English.
This is used to set one of the languages available: English, Italian, French, German, Spanish and Turkish.
English and Italian are pre-installed on the drive. To select Italian:



Press **E** to confirm the modification or **ESC** to cancel.

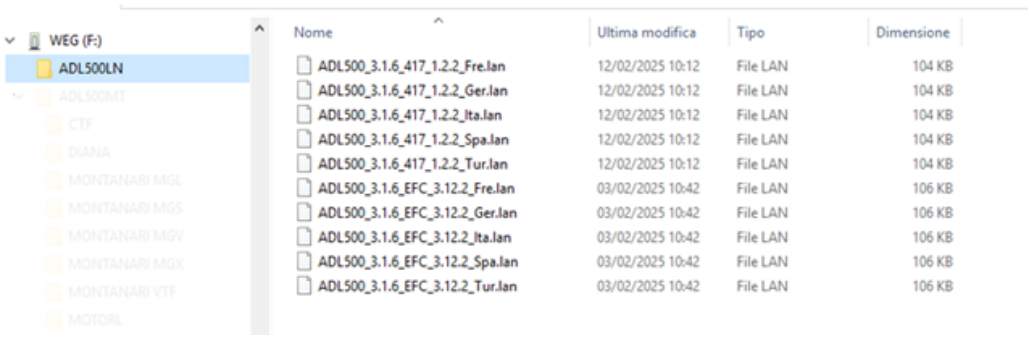
To set a different language:

ADL530 and ADL550 (from keypad using USB)

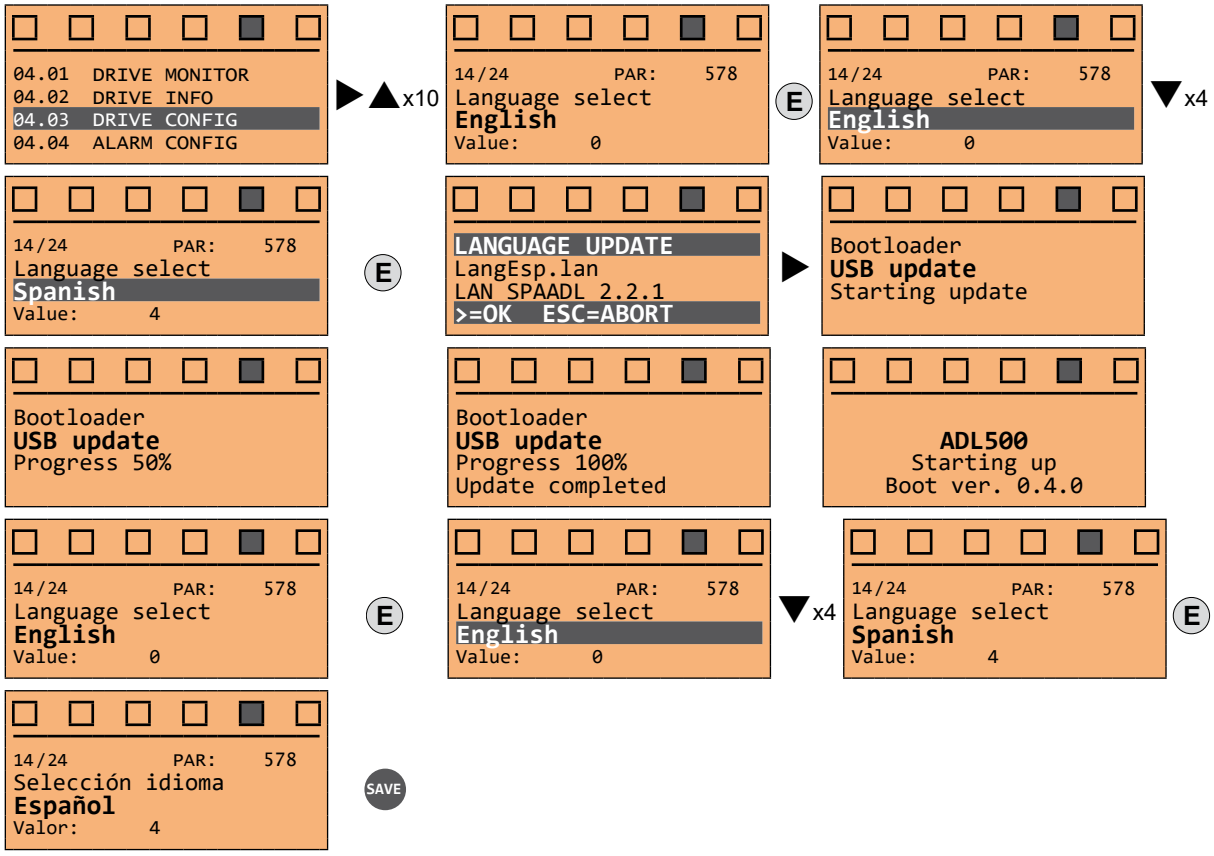
- Download the available languages file from the WEG site (https://www.weg.net/..., DRIVE SET-UP folder).

NOTE! The language file must be aligned with the version of both the drive firmware and application. Check correspondence!

- Unzip and save the files on a USB flash drive, in a folder called “ADL500LN”. It is necessary that in the ADL500LN folder the language files (.lan) are separated without further subfolders (see example below).



- Insert the flash drive into the drive's USB port.
- Select the **Language Select** parameter and set the new language as shown in the example below (note that the drive will reboot once the language loading procedure has been completed).
- Save the new configuration (press SAVE).



NOTE! The new language will be loaded into the drive memory and replace the Italian. English cannot be replaced by another language.

ADL510, ADL530 and ADL550 (from WEG DriveLabs configurator with fw version pervious 3.1.10)

- Install the WEG DriveLabs configurator on the PC (available on the web site at the path https://www.weg.net/...)
- Connect the Ethernet cable to the PC Ethernet port and the ADL5x0 drive ETH-PC port;
- Run WEG DriveLabs and open the WIZARD / Setup Wizard menu;
- Click "Next" to select the **Language select** menu;
- Select the required language in the field "Value" of parameter 578 **Language select;**
- Press "Next" until selecting "Summary" and then click "Download";
- When the update is completed, "Setup done" is displayed;
- Reboot the drive and, from keypad, select the new language via the **Language Select** parameter 578.

ADL510, ADL530 and ADL550 (from WEG DriveLabs configurator with fw 3.1.10 or upper)

- Install the WEG DriveLabs configurator on the PC (available on the web site at the path https://www.weg.net/...)
- Connect the Ethernet cable to the PC Ethernet port and the ADL5x0 drive ETH-PC port;
- Run WEG DriveLabs and open the WIZARD / Setup Wizard menu;
- Click "Next" to select the **Language select** menu;
- Select the required language in the field "Value" of parameter 578 **Language select** and then click "Download";
- When the update is completed, "Setup done" is displayed;
- Reboot the drive and, from keypad, select the new language via the **Language Select** parameter 578.

8.2.8.2 Access level selection

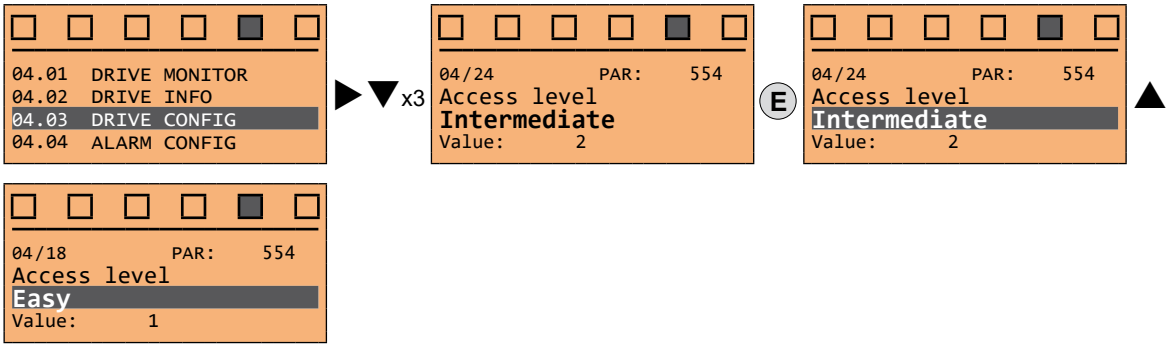
Menu DRIVE CONFIG, parameter 04.03 **Access mode**, PAR: 554.
Enables two methods of access to be configured:

Readonly	a read-only level, where a limited number of parameters are displayed.
Easy	this level allows the parameters to be displayed and modified for basic commissioning, in V/f control and without tuning.
Intermediate	(default) this level allows the parameters to be displayed and changed for complete

commissioning and basic optimisation.

Expert this level is for displaying and changing parameters for advanced optimisation.

Service Reserved for WEG Service.



8.2.9 Startup display

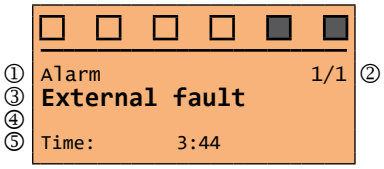
Menu DRIVE CONFIG, parameter **Startup display**, PAR: 574.
This is used to set the parameter that will be displayed automatically at drive power-on.
Entering the value -1 (default), the function is disabled and the main menu is displayed at power-on.

8.2.10 Back-lighting of the display

Menu DRIVE CONFIG, parameter **Display backlight**, PAR: 576. Sets lighting of the display:
On the light of the display always stays on.
Off (default) the light switches off approx. 3 minutes after the last key is pressed.

8.2.11 Alarms

The alarms page is displayed automatically when an alarm occurs.



(1) **Alarm**: identifies the alarm page.
RTN: indicates that the alarm has been reset; if the alarm is still active, nothing is displayed.

(2) **x/y**: **x** indicates the position of this alarm in the list of alarms and **y** the number of alarms (the alarm with lowest x is the most recent).

(3) Description of the alarm.

(4) Sub-code of the alarm, provides other information in addition to the description.

(5) The moment when the alarm occurred in machine time. It should be understood as the moment referring to the activation time of the unit and not as the local time.

The list of alarms is scrolled using the ▲ and ▼ keys.

NOTE! For further information, see **chapter "10.1 Alarms"**.

8.2.11.1 Alarm reset

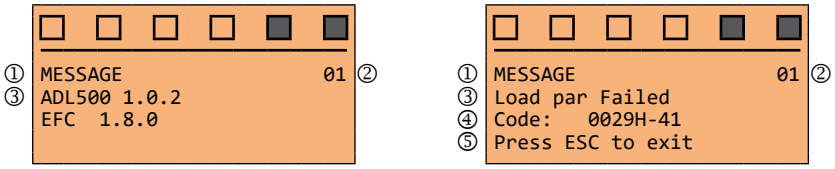
- **If the alarm page is displayed:**
  Pressing the **RST** key, the alarms are reset and all alarms that have been reset are eliminated from the list. If, after this operation, the list of alarms is empty, the alarm page is closed. If the list is not empty, press the **ESC** key to exit the alarms page.
- **If the alarm page is not displayed:**
  Press the **RST** key to reset the alarms. If active alarms are still present following reset, the alarm page is opened.

8.2.12 Messages

Operator messages are displayed with this page.
There are two types of messages:

- timed (closed automatically after a certain number of seconds),
- permanent (continue to be displayed until the operator presses the **ESC** key).

Several concurrent messages are enqueued and presented to the operator in sequence, starting from the most recent.



(1) **Message**: identifies a message.

(2) **xx** indicates how many messages are enqueued. The queue may contain a maximum of 10 messages and the message with the highest number is the most recent.

(3) Description of the message

(4) Sub-code of the message. Provides extra information in addition to the description.

(5) "**Press ESC to exit**" is displayed if the message requires acknowledgment.

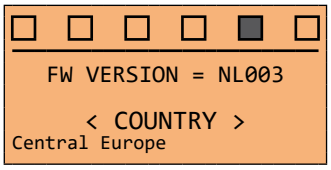
When a message is closed, the next message is displayed until the queue is empty.

NOTE! For further information, see **chapter "10.3 Messages".**

8.2.13 Saving and recovery of new parameter settings

8.2.13.1 Saving and recovery of new parameter settings on optional keypad KB-ADL500

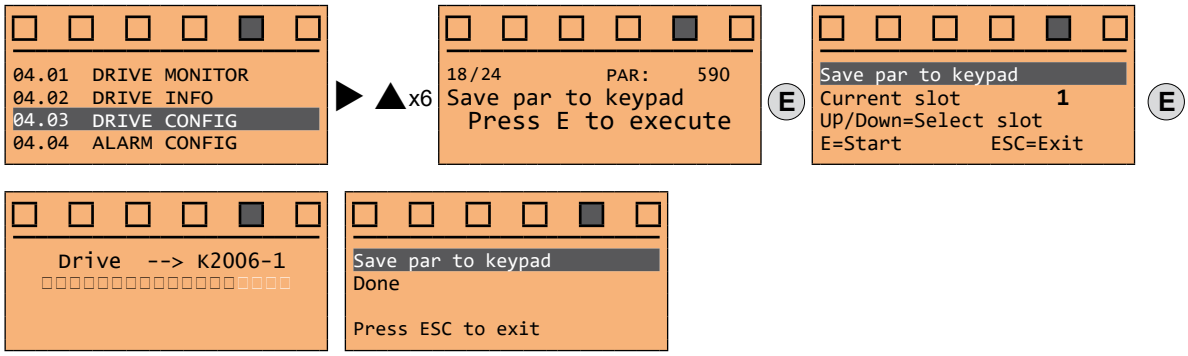
NOTE! This function is available for KB-ADL500 keypads only from firmware version NL003 (to see the keypad fw version, disconnect it from the ethernet cable or remove it from its housing and then reconnect it by holding down the E key).



Drive parameters can be saved on the keypad in 5 different memory areas. This function is useful for obtaining various sets of parameters, for safety backup or transferring parameters from one drive to another.

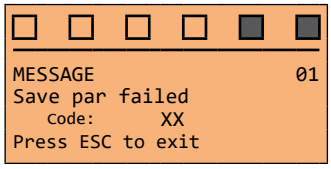
- **Saving of parameters on the keypad**

Menu 4.3 DRIVE CONFIG, parameter **Save par to keypad**, PAR: 590. This is used to transfer the parameters from the drive to the selected keypad memory.



To start the operation, press the **E** key.
During transfer, a bar is displayed which indicates progress of the operation.

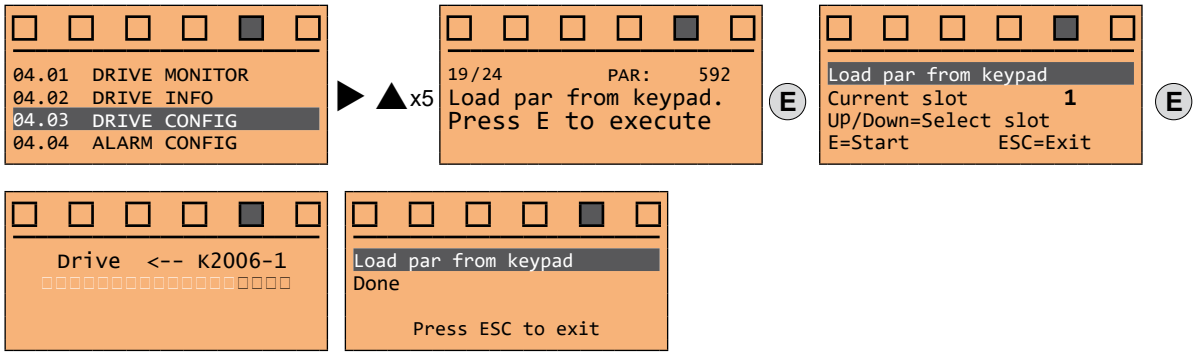
Instead of the letter **X**, the number of the currently selected keypad memory is displayed.
At the end of transfer, if this has been completed successfully, the "**Done**" caption is displayed for a few seconds with subsequent return to the initial page.
If an error occurs during transfer, the following message is displayed:



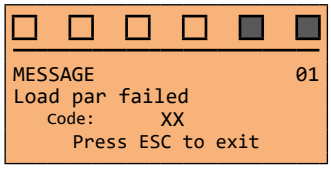
The code **XX** indicates the type of error, **see paragraph 10.3**. To exit the error message, press the **ESC** key.

- **Load parameters from keypad**

Menu 4.3 DRIVE CONFIG, parameter **Load par from keypad.**, PAR : 592. This is used to transfer the parameters from the selected memory of the keypad to the drive.



To start the operation, press the **E** key. During transfer, a bar is displayed which indicates progress of the operation.
Instead of the letter **X**, the number of the currently selected keypad memory is displayed.
At the end of transfer, if this has been completed successfully, the "**Done**" caption is displayed for a few seconds with subsequent return to the initial page.
If an error occurs during transfer, the following message is displayed:



The code **XX** indicates the type of error, **see paragraph 10.3**. To exit the error message, press the **ESC** key.

- **Transfer of parameters between drives**

Transfer the parameters of the source drive to the keypad memory as indicated above in paragraph "Saving of parameters on the keypad" , then connect the keypad to the drive where the new setting is to be saved and follow the procedure described in paragraph "Load parameters from keypad".

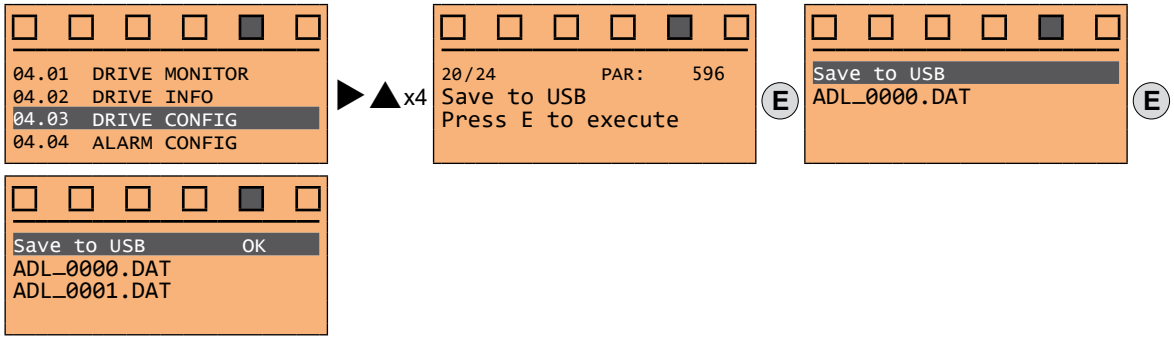
To prevent possible damage to equipment, it is advisable to disconnect and connect the keypad with the drive off.

8.2.13.2 Saving and recovery of new parameter settings on USB

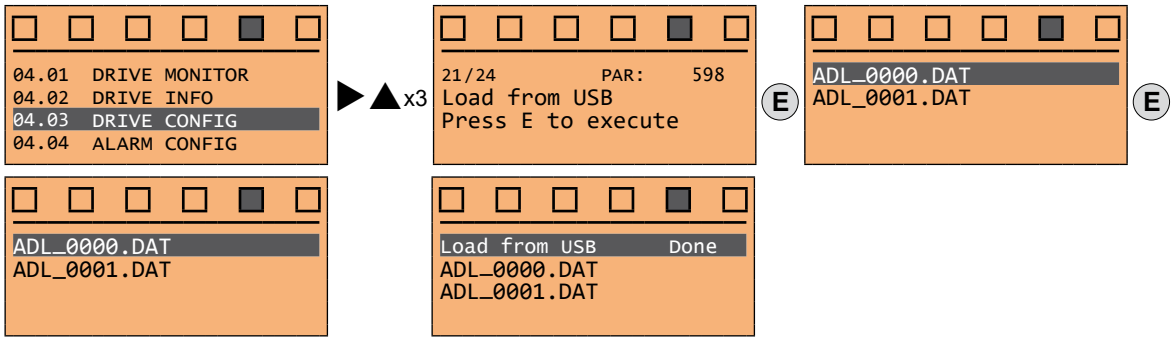
(ADL550 and ADL530 only)

Drive parameters can be saved on a USB memory: this function is useful for obtaining various sets of parameters, for safety backup or transferring parameters from one drive to another.

To save drive parameters on the memory USB: Menu DRIVE CONFIG, parameter **Save to USB**, PAR 596:



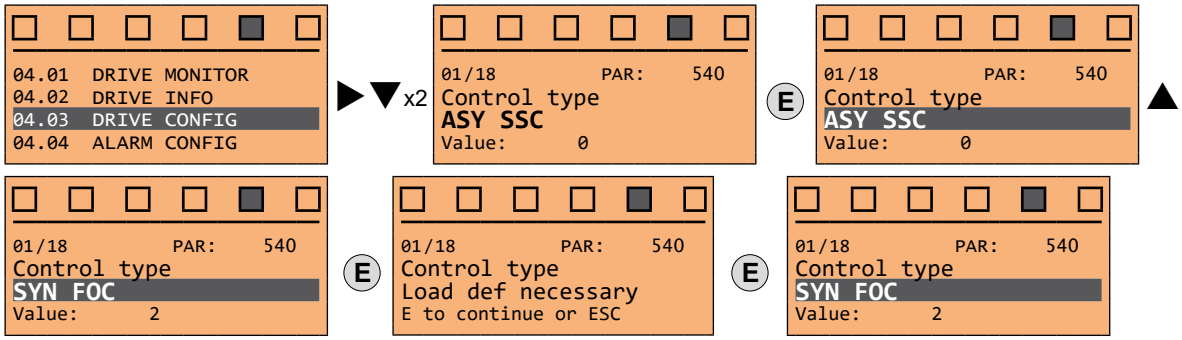
To transfer (recover) parameters from the memory USB to the drive: Menu DRIVE CONFIG, parameter **Load from USB**, PAR 598 :



8.2.14 Asynchronous/Synchronous selection

- **To switch from Asynchronous to Synchronous:**

Menu DRIVE CONFIG, PAR 540 **Control type**

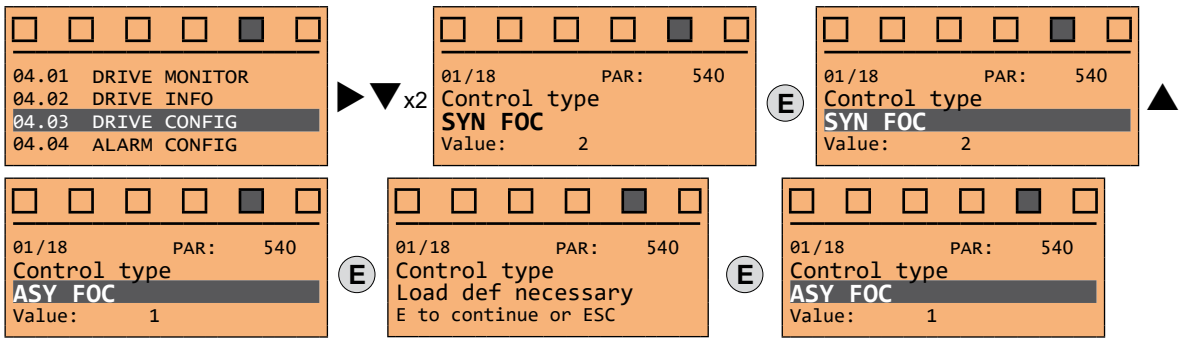


Press E to reset the drive and restart in the new operating mode.

NOTE! Important: the default parameters including the LIFT application are reloaded. This can only be done with the drive disabled.

- **To switch from Synchronous to Asynchronous:**

Menu DRIVE CONFIG, PAR 540 **Control type:**



The example shows the selection (1) **ASY FOC**, other modes are available: (0) **ASY SSC**, (2) **SYN FOC**.
Press **E** to reset the drive and restart in the new operating mode.

NOTE! Important: the default parameters including the LIFT application are reloaded. This can only be done with the drive disabled.

9 - Commissioning via keypad

WARNING!

Adjustable frequency drives are electrical apparatus for use in industrial or civil installations. Parts of the Drives are energized during operation. The electrical installation and the opening of the device should therefore only be carried out by qualified personnel. Improper installation of motors or Drives may therefore cause the failure of the device as well as serious injury to persons or material damage. Drive is not equipped with motor overspeed protection logic other than that controlled by software. Follow the instructions given in this manual and observe the local and national safety regulations applicable.

Always connect the Drive to the protective ground ⏚ (PE) via the marked connection.
ADL500 Drives and AC Input filters have ground leakage currents greater than 3.5 mA. EN 61800-5-1 specifies that with leakage currents greater than 3.5 mA the protective conductor ground connection (⏚) must be fixed type and doubled for redundancy if its section is lower than 10mm^2 CU o 16mm^2 AL.

Only permanently-wired input power connections are allowed. This equipment must be grounded (IEC 536 Class 1, NEC and other applicable standards).
If a Residual Current-operated protective Device (RCD) is to be used, it must be an RCD type B. Machines with a three phase power supply, fitted with EMC filters, must not be connected to a supply via an ELCB (Earth Leakage Circuit-Breaker - see DIN VDE 0160).
The following terminals can carry dangerous voltages even if the inverter is inoperative:

- the power supply terminals L1, L2, L3, C1, C, D.
- the motor terminals U, V, W.

Do not touch or damage any components when handling the device. The changing of the isolation gaps or the removing of the isolation and covers is not permissible.

Carefully configure the motor parameters to ensure the proper operation of the overload protection.
ADL500 operates at high voltages.

Provide additional precautions external to the Drive (such as limit switches, mechanical switches, etc.) or provide functions to ensure or apply safe operation, at the time of any failure in the recording equipment such that it can cause material damage or even serious personal injury (for example, potentially dangerous failures).

Some parameter settings may cause the inverter to restart automatically after a power failure.

Do not use this appliance as an "emergency stop mechanism" (which is defined in accordance with EN 60204-1).

Do not open the device or lids while it is powered by mains. The minimum waiting time before acting on the terminals or inside the device is indicated in chapter "4.7 Inverter voltage level for safety operations".

Fire and Explosion Hazard:
The installation of Drives in areas classified as hazardous, where flammable substances or combustible vapours or dust are present, can cause fires or explosions. Drives must be installed outside these hazardous areas even if they are used with motors suitable for use in these conditions.

WARNING!

Protect the appliance from unauthorized environmental stress (temperature, humidity, blows, etc.) .

At the drive output (U, V, W terminals):

- no tension may be applied.
- it is not allowed to insert several Drives in parallel
- direct connection of inputs and outputs is not permitted (bypass)
- capacitive loads cannot be connected (e.g. power factor correction capacitors).

Electrical commissioning must be carried out by qualified personnel. This is responsible for the fact that there is an adequate ground connection and protection of power cables according to local and national requirements. The motor must be protected against overload.

Do not connect supply voltages that exceed the permissible voltage range. If excessive voltages are applied to the Drive, its internal components will be damaged.

It is not allowed to operate the Drive without the grounding connection. To avoid disturbance, the motor casing shall be grounded through a ground connector separated from the ground connectors of other equipment.

Dielectric rigidity tests must not be performed on parts of the Drive. Appropriate measuring instruments (minimum internal resistance 10 kω/V) shall be used for measuring the voltage of the signals.

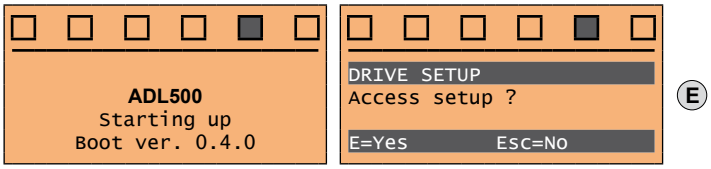
9.1 DRIVE SETUP

DRIVE SETUP, which is a procedure that is presented to the user **only when the drive is first turned on**, allows all the files required for the user's needs and the type of system to be imported.
If setup has been completed but the user wishes to see it again, it is necessary to execute the **Load default** procedure (PAR 580).
All the setup parameters are also available in the different drive menus.

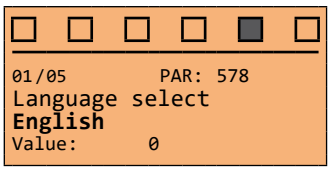
The setup steps are as follows:

- **Load language** **See step 1**
- **Load application (ADL550 and ADL530)** **See step 2**
- **Load parameters from USB (ADL550 and ADL530)** **See step 3**
- **Set encoder parameters** **See step 4**
- **Select Motor from USB (ADL550 and ADL530)** **See step 5**

When the drive is first switched on:



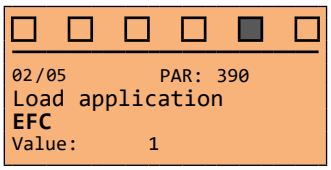
Step 1 – Load language



Set the language to be used to program the drive (default English).
Press ▼ to go to the next step or press E to change the selection.
Options available: (0) English, (1) Italian, (2) French, (3) German, (4) Spanish, (5) Turkish.
To set a language other than English or Italian, see section "8.2.8.1 Language selection".

Step 2 – Load application

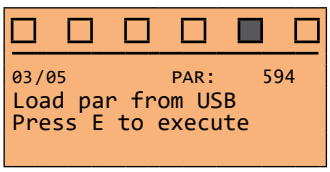
This feature allows you to load different versions of applications or update those already installed. The other way that is used to update applications is to update them directly together with all the fw through the function load files from USB or update fw from APP or from WEG_DriveLabs.



Set the application to be used by the drive (default **EFC**).
Press ▼ to go to the next step or press E to change the selection.
The new application can be loaded onto the drive via an USB key connected to the USB port by selecting the desired .fl2 file. For ADL510 drives, the application can be updated via the configurator.

Step 3 – Load parameters from USB

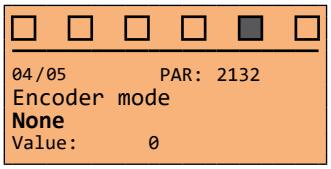
For ADL550 and ADL530 only.



Transfer the parameters from the memory connected to the drive's USB port.
Press ▼ to go to the next step or press E to load the parameters from USB.

NOTE! Before loading new parameters from USB it is recommended to perform a load default operation followed by a save parameter.

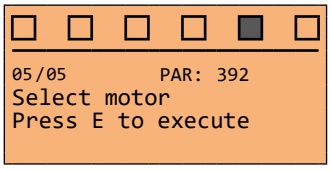
Step 4 – Set encoder parameters



Select the type of encoder (default **None**).
Press ▼ to go to the next step or press E to change the selection.
Options available: (1) Digital, (2) Sinus, (3) Sinus SINCOS, (4) Sinus ENDAT, (5) Sinus BiSS, (6) ENDAT, (7) BiSS.

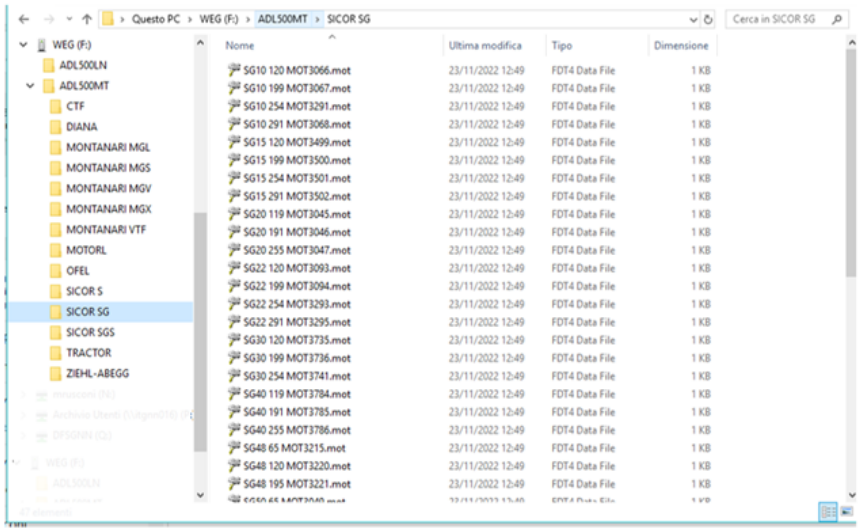
Step 5 – Select Motor from USB

For ADL550 and ADL530 only.

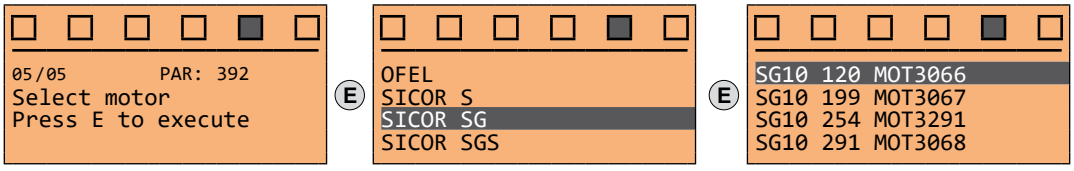


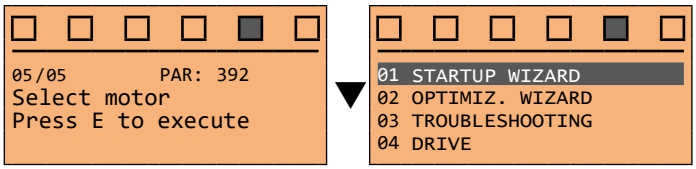
This parameter allows motor data to be loaded into the drive from a library (file extension .mot) saved on USB memory device (download the available Motor library from the WEG site, https://www.weg.net/catalog/weg/MW/en/Drives/Variable-Speed-Drives/Drives-for-Elevators/Variable-Speed-Drive-ADL500/Variable-speed-drive-ADL500/p/MKT_WDC_GLOBAL_PRODUCT_INVERTER_FOR_ELEVATOR_ADL500). This is displayed only if the USB memory device contains the motor libraries in a folder named “ADL500MT”.

The motor library must be located in the ADL500MT folder, positioned in the main folder of the USB flash drive. The ADL500MT folder contains several subfolders corresponding to the motor families. Inside each subfolder, there are the motor files for that family. The folder structure is shown in the following figure:



Press ▼ to exit or press E to display the files with .mot extension saved on a USB memory.



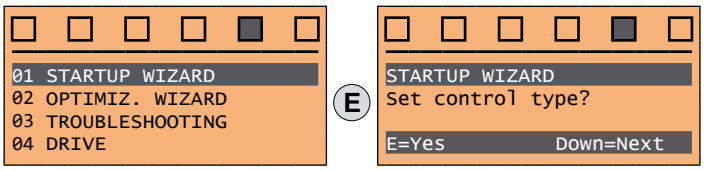


9.2 STARTUP WIZARD for Asynchronous motor

The **STARTUP WIZARD** is a guided procedure used for quick start-up of the drive that helps to set the main parameters.
It consists of a series of questions, relating to the various sequences for entering and calculating the parameters necessary for correct drive and lift application operation. The order of these sequences is as follows:

- **Setting control type** — **See step 1**
- **Setting communication mode** — **See step 2**
- **Setting encoder parameters (Control type =** ASY SSC or ASY FOC**)** — **See step 3**
- **Setting motor data** — **See step 4**
- **Setting mechanical system data** — **See step 5**
- **Setting the system speeds** — **See step 6**
- **Activating the EBC** (does not apply to ASY SSC motors) — **See step 7**
- **Setting the EBC** (does not apply to ASY SSC motors and is only visible if the EBC is activated)
- **Autotune with motor at stand-still** — **See step 8**
- **Saving parameters** — **See step 9**

The format of the function selection page is as follows:

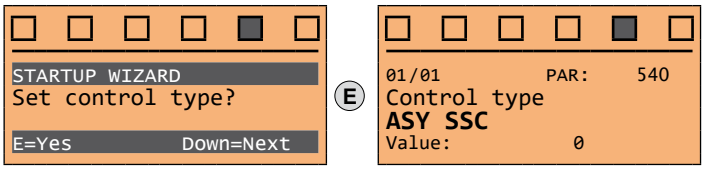


Pressing the **E** key, the function to be programmed is accessed.
Press the ▼ (Down) key to move to the next function skipping the current function.
Press the ▲ (Up) key to return to the previous function.

To terminate the sequence of functions and return to the menu, press the **ESC** key.

At the end of the sequence, once the parameters have been saved, if commissioning is successful, the main menu will return.

Step 1 – Setting control type

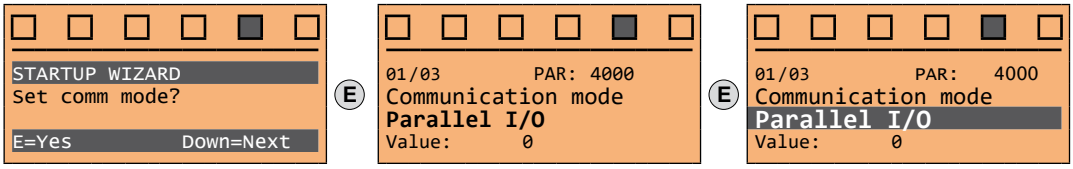


Available selections:
(0) ASY SSC (Default)
(1) ASY FOC
(2) SYN FOC only for ADL530 and ADL550.

At the end of the procedure proceed to next step.

Step 2 – Setting communication mode

Set the type of communication to be used.



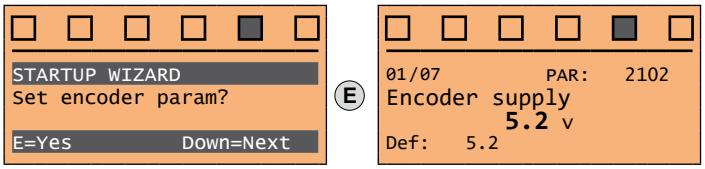
Available selections: (0) Parallel I/O, (1) CANopen.
At the end of the procedure proceed to next step.

Step 3 – Setting encoder parameters

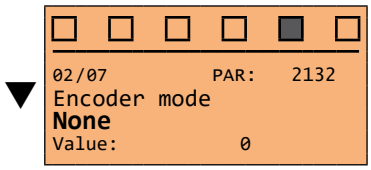
CAUTION!

The incorrect configuration of the encoder tension can permanently damage the device; therefore, it is advisable to check the values on the encoder's specification plate.

Set the following parameters for the encoder installed on the motor:



Range: 5.2 ... 20V

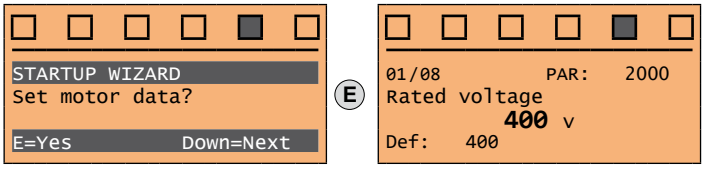


Available selections:
0 None (default)
1 Digital
2 Sinus
3 Sinus SINCOS (only for ADL530 and ADL550)
4 Sinus ENDAT (only for ADL530 and ADL550)
5 Sinus BISS (only for ADL530 and ADL550)
6 ENDAT (only for ADL530 and ADL550)
7 BiSS (only for ADL530 and ADL550)
8 Sinus SSI (only for ADL530 and ADL550)
6 ENDAT (only for ADL530 and ADL550)
7 BiSS (only for ADL530 and ADL550)
8 Sinus SSI (only for ADL530 and ADL550)

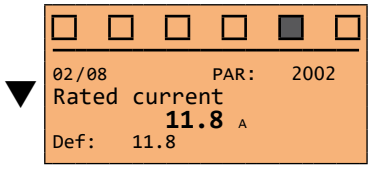
Step 4 – Setting motor data

NOTE!

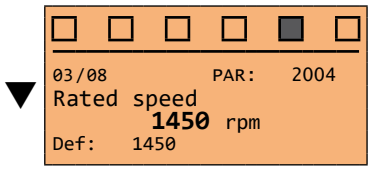
Def: The factory (default) setting depends on the size of the drive that is connected. These values refer to the ADL5.-1055.



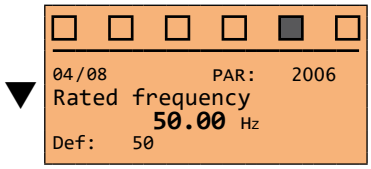
Range: 230 ... 480V



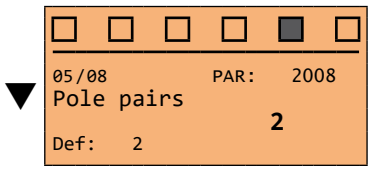
Range: 1 ... 1500A



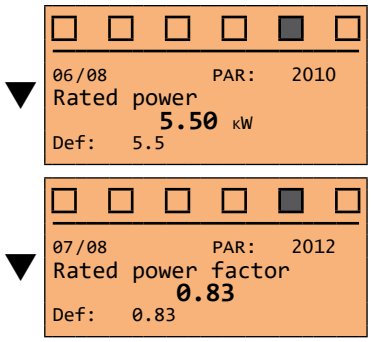
Range: 10 ... 32000rpm



Range: 10 ... 1000Hz



Range: 1 ... 60



Range: 0.1 ... 1500kW

Range: 0.6 ... 0.95

Set the plate data of the motor connected, according to the procedures described on the previous pages.

Rated voltage [V]: the rated voltage of the motor indicated on the data plate.

Rated current [A]: motor rated current; approximately, the value should not be less than 0.3 times the rated current of the drive, output current class 1 @ 400 V on the data plate of the drive.

Rated speed [rpm]: rated speed of the motor; this value must reflect the speed of the fully loaded motor at rated frequency. If slip is indicated on the motor data plate, set the Rated speed parameter as follows: Rated speed = Synchronous speed - Slip (e.g. for a 4-pole motor Rated speed = 1500 - 70 = 1430).

Rated frequency [Hz]: rated frequency of the motor, as shown on the data plate (asynchronous motors only).

Pole pairs: Number of motor pole pairs. The number of motor pole pairs is calculated using the plate data and the following formula: P = 60 [s] x f [Hz] / nN [rpm]

Where: P = motor pole pairs, f = motor rated frequency (e.g. 50); nN = motor rated speed (e.g. 1450)

Rated power [kW]: Motor rated power; for a motor data plate with an HP power value, set the rated power kW = 0.736 x the motor power HP value.

Rated power factor: Leave the default rated power factor if the data are not available on the data plate.

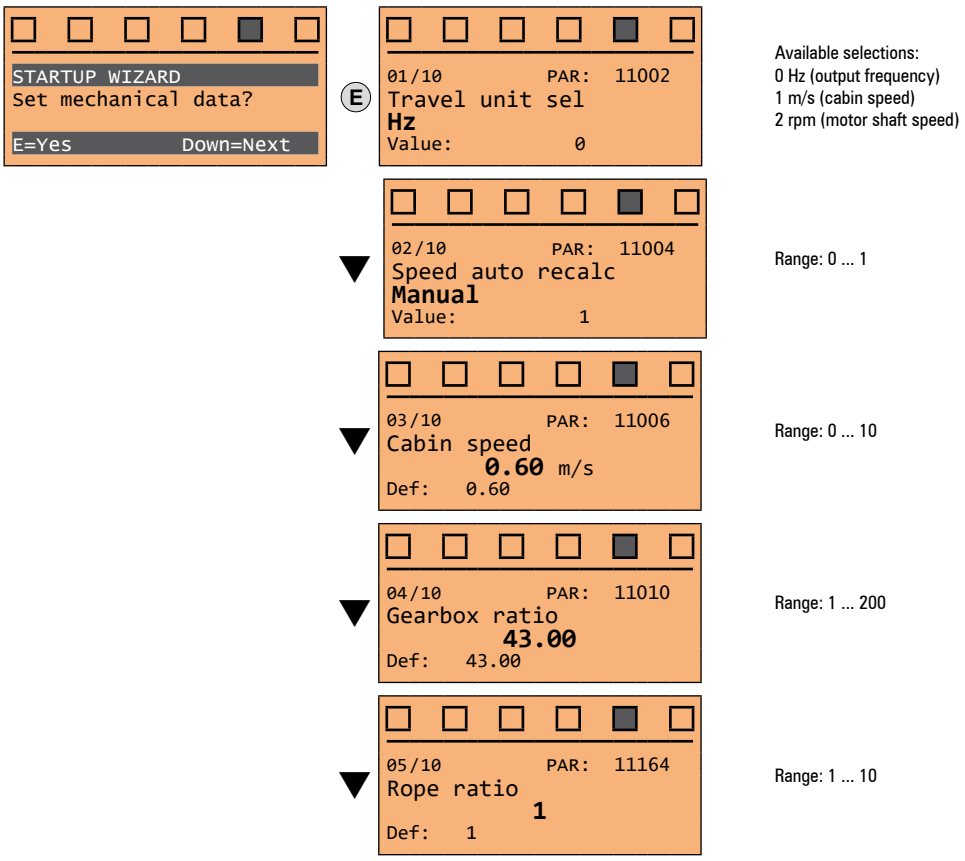
NOTE!

When data entry is complete the **Take parameters** command is executed automatically (menu MOTOR DATA, PAR 2020). The motor data entered during the STARTUP WIZARD procedure are saved in a RAM memory to enable the drive to perform the necessary calculations.

These data are lost if the device is switched off. To save the motor data follow the procedure described in step 9.

At the end of the procedure proceed to next step.

Step 5 – Setting mechanical system data



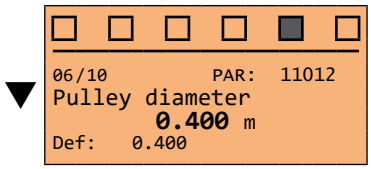
Available selections:
0 Hz (output frequency)
1 m/s (cabin speed)
2 rpm (motor shaft speed)

Range: 0 ... 1

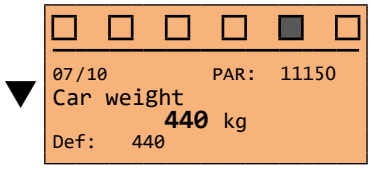
Range: 0 ... 10

Range: 1 ... 200

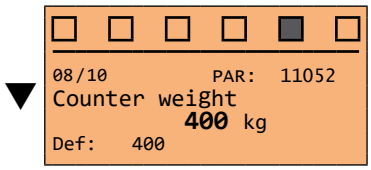
Range: 1 ... 10



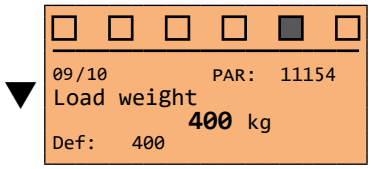
Range: 0 ... 5



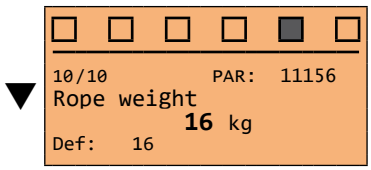
Range: 0 ... 10000



Range: 0 ... 10000



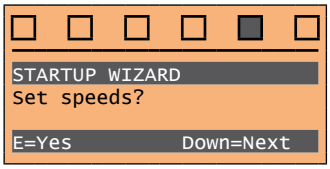
Range: 0 ... 10000



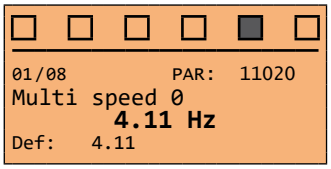
Range: 0 ... 10000

At the end of the procedure proceed to next step.

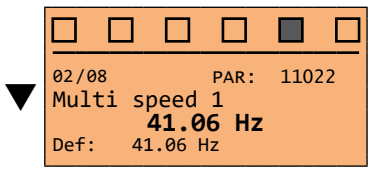
Step 6 – Setting the system speeds



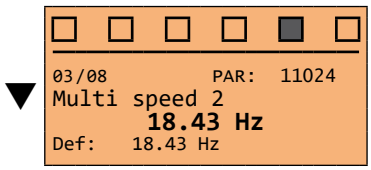
E



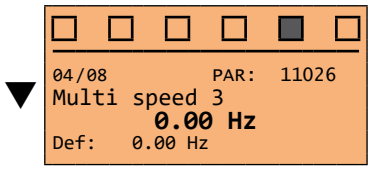
Range: 0 ... 10000



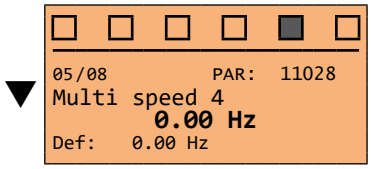
Range: 0 ... 10000



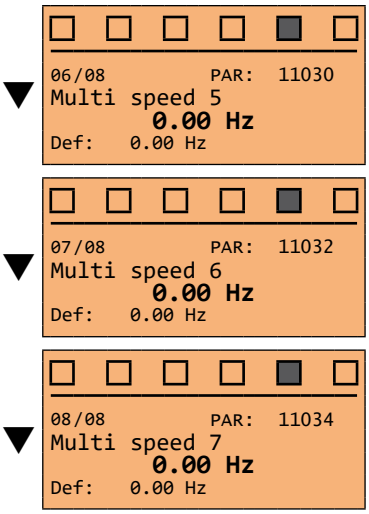
Range: 0 ... 10000



Range: 0 ... 10000



Range: 0 ... 10000



Range: 0 ... 10000

Range: 0 ... 10000

Range: 0 ... 10000

NOTE!

The first three multispeeds take the values of 10%, 100% and 45% of the cabin speed each time the mechanical data is changed. If you do not wish to keep the first three multispeeds at the preset percentage of the car speed, you must put in mode "manual" parameter IPA 1104, which can be found in the mechanical data menu.

If IPA 1104 is changed from manual to auto for change automatically speed parameters is necessary to change before one mechanical data.

In addition, each time mechanical data within the respective menu is changed, the drive performs a multispeed congruity check that works as follows:

a) where a multispeed is greater than the nominal speed, it shall be limited to that speed with a 10% surcharge;

b) if the mechanical values are changed further and the previously limited speeds are now lower than the nominal speed, these multispeeds are not changed (bearing in mind that the first 3 multispeeds always take the values in % if parameter IPA 11004 is setted how auto).

By manually entering values of multispeed these are limited to the cabin speed with a 10% surcharge, while following a change in the mechanical parameters that change the cabin speed, will be returned to the default values percentages (only if IPA 1104 is left in auto mode).

ATTENTION!

Multi speed configuration table:

Through the combination of "MtlSpd S0" (Digital input 4), "MtlSpd S1" (Digital input 5) and "MtlSpd S2" (Digital input 6) commands, is possible to select Multi speed desired, according to next table:

MtlSpd S2	MtlSpd S1	MtlSpd S0	ACTIVE SPEED
0	0	0	Multispeed 0, PAR 11020
0	0	1	Multispeed 1, PAR 11022
0	1	0	Multispeed 2, PAR 11024
0	1	1	Multispeed 3, PAR 11026
1	0	0	Multispeed 4, PAR 11028
1	0	1	Multispeed 5, PAR 11030
1	1	0	Multispeed 6, PAR 11032
1	1	1	Multispeed 7, PAR 11034

.

At the end of the procedure proceed to next step.

Step 7 - Activation and setting of the EBC - Electronic Braking module

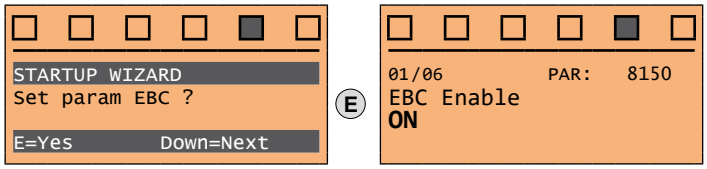
If you want to have the drive version ADL550 an electronic control brake EBC, putting the EBC activation parameter in ON the menu is expanded and you are asked to enter the parameters of the brake plate: The nominal power and the nominal voltage of the brake during the maintenance phase. If the label had only the power and the nominal voltage at full power then the power value in maintenance to be inserted in the drive is given by the formula:

Pmant =Vmant^2 / Vnom^2 * Pnom

Where:
P mant = Power value in maintenance
V mant = Voltage value in maintenance
P nom = Nominal power
V nom = Nominal voltage

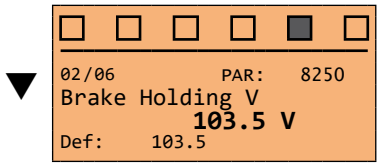
NOTE!

Communication with the EBC is only activated after the drive is restarted. Then when the EBC is activated and configured you have to save, restart the drive and then return to the end of this step 6 to continue with the self-learning of the next step.

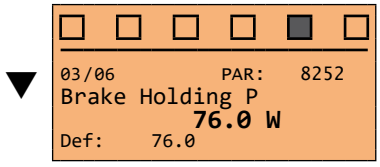


Available selections:
ON EBC enabled
OFF EBC disabled

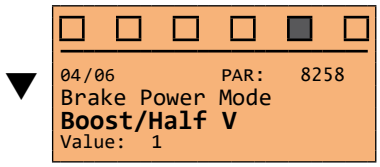
If the previous parameter is set to ON then the submenus are also displayed which follow.



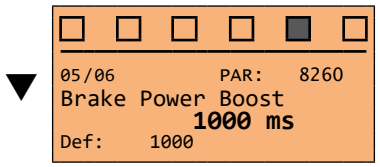
Range 1 ... 207



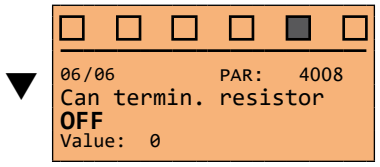
Range 1 ... 207



Selezioni disponibili:
Full voltage
Boost/Half V
Boost/Hold V



Range 0 ... 5000



Range 0 ... 1

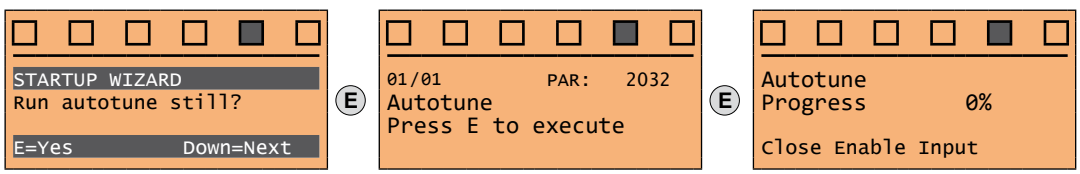
At the end of the procedure proceed to next step.

Step 8 – Autotune with motor at stand-still

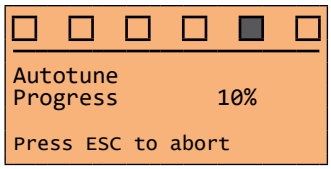
The drive carries out the motor autotune procedure (real measurement of motor parameters).
The procedure is fast and recommended in most cases.

NOTE!

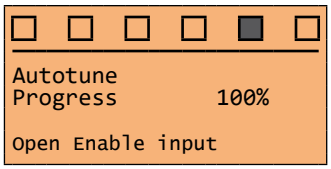
If this operation generates an error message, check the connections o the power and control circuits (see **step 1** - Connections), check the motor data settings (see **step 3** - Setting motor parameters) and then repeat the guided Autotune procedure.



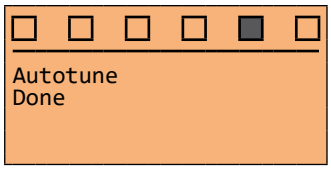
(1) (2) (3)



(4)



(5)



(6)

(1) Press the **E** key to proceed to the autotune procedure.

(2) Press the **E** key to start the autotune procedure.

(3) Enable the drive by connecting terminal 9 (Enable) to terminal 12 (+24 V). To abort this operation, press the **ESC** key.

(4) Once the drive is enabled the autotune procedure starts. This may take a few minutes, depending on the type of motor being used.

(5) At the end of the procedure the following screen (6) is displayed. After opening the Enable contact, go to next step.

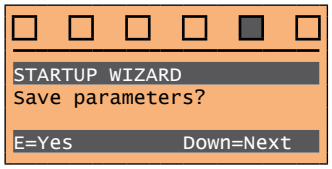
NOTE!

At the end of the autotune procedure there is a request to open the Enable contact (terminals 9 - 12); this results in the automatic execution of the **Take tune parameters** command (menu MOTOR DATA, PAR 2078).

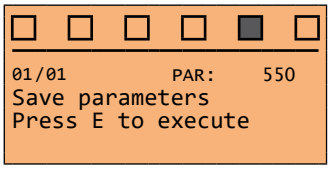
The calculated parameters are saved in a RAM memory to enable the drive to perform the necessary calculations. These data are lost if the device is switched off. To save the motor data follow the procedure described in step 7.

Step 9 – Save parameters

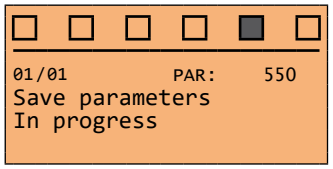
To save the new parameter settings, so that they are maintained also after power-off, proceed as follows:



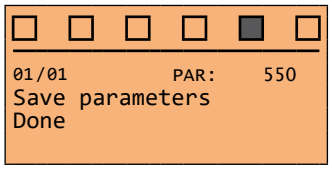
(1)



(2)



(3)



(4)

(5)

(1) Press the **E** key to start the save parameters procedure.

(2) Press **E to confirm**

(3) End of procedure

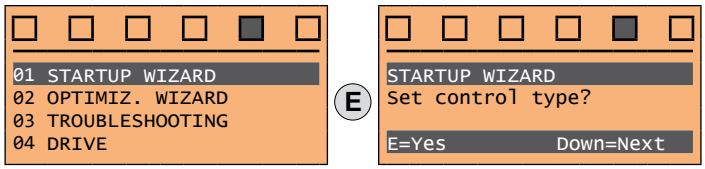
(4) When the parameters have been saved correctly the drive displays this screen to show that the startup wizard is complete.

9.3 STARTUP WIZARD for synchronous motors

The STARTUP WIZARD is a guided procedure used for quick start-up of the drive that helps to set the main parameters and perform automatic absolute encoder timing.
It consists of a series of questions, relating to the various sequences for entering and calculating the parameters necessary for correct drive and lift application operation. The order of these sequences is as follows:

- **Setting control type** **See step 1**
- **Setting communication** **See step 2**
- **Setting encoder parameters** **See step 3**
- **Setting motor data** **See step 4**
- **Setting mechanical system data** **See step 5**
- **Setting the system speeds** **See step 6**
- **Activating the EBC** **See step 7**
- **Setting the EBC** (is only visible if the EBC is activated)
- **Autotune with motor at stand-still and encoder phasing** **See step 8**
- **Saving parameters** **See step 9**

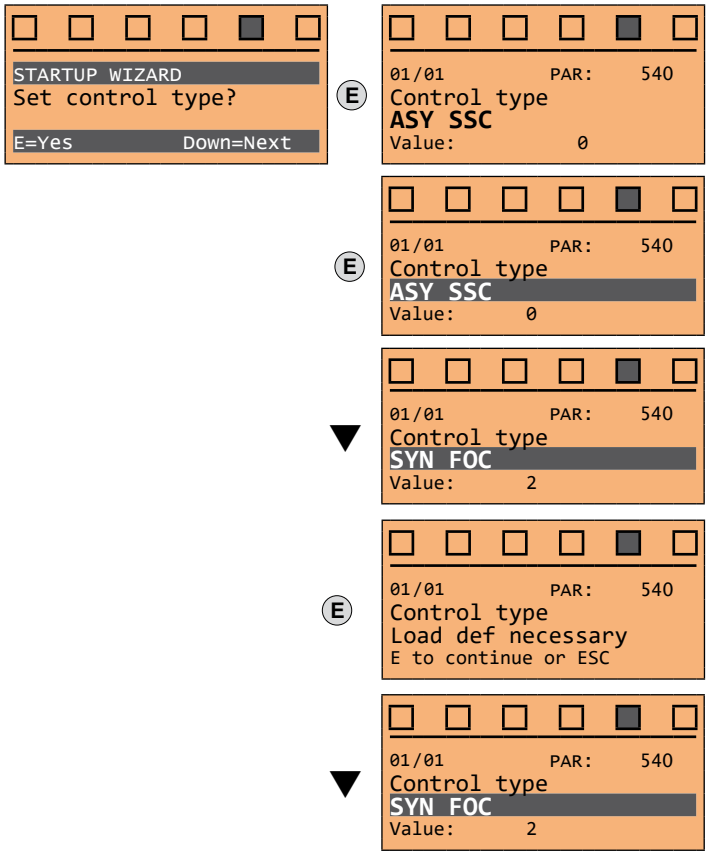
The format of the function selection page is as follows:



Pressing the **E** key, the function to be programmed is accessed.
Press the ▼ (Down) key to move to the next function skipping the current function.
Press the ▲ (Up) key to return to the previous function.

To terminate the sequence of functions and return to the menu, press the **ESC** key.
At the end of the sequence, once the parameters have been saved, if commissioning is successful, the main menu will return.

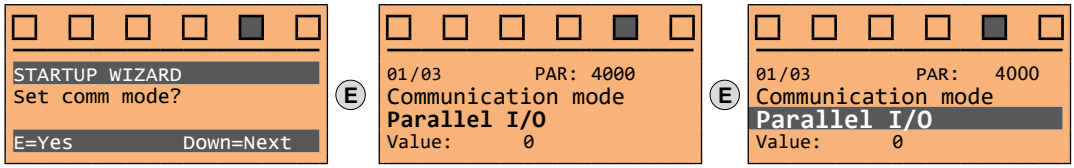
Step 1 – Setting control type



At the end of the procedure proceed to next step.

Step 2 – Setting communication

Set the type of communication to be used.



Available selections: (0) Parallel I/O, (1) CANopen.

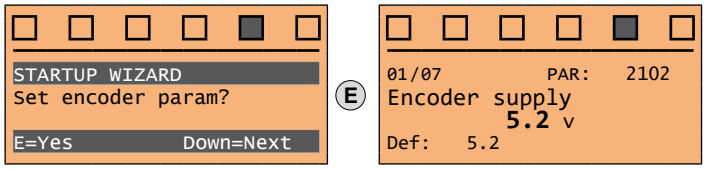
At the end of the procedure proceed to next step.

Step 3 – Setting encoder parameters

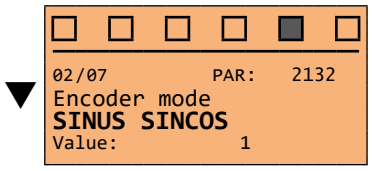
CAUTION!

The incorrect configuration of the encoder voltage can permanently damage the device; therefore, it is advisable to check the values on the encoder's specification plate.

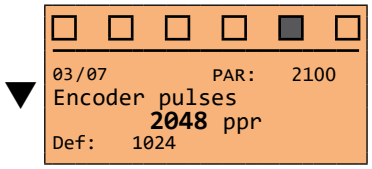
Set the following parameters for the encoder installed on the motor:



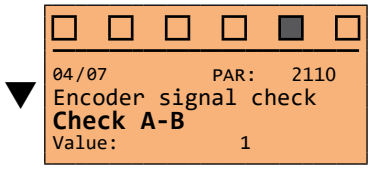
Range: 5.2 ... 20V



Available selections:
0 None (default)
1 Digital
2 Sinus
3 Sinus SINCOS (only for ADL530 and ADL550)
4 Sinus ENDAT (only for ADL530 and ADL550)
5 Sinus BISS (only for ADL530 and ADL550)
6 ENDAT (only for ADL530 and ADL550)
7 BiSS (only for ADL530 and ADL550)
8 Sinus SSI (only for ADL530 and ADL550)



Range: 4 ... 16384



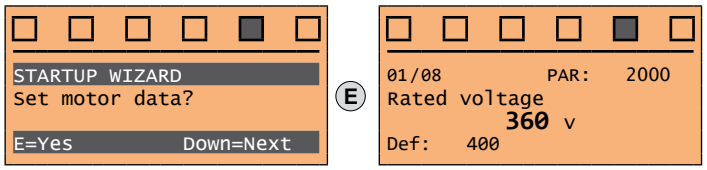
Available selections:
(1) Check A-B
(2) Check A-B-Z

At the end of the procedure proceed to next step.

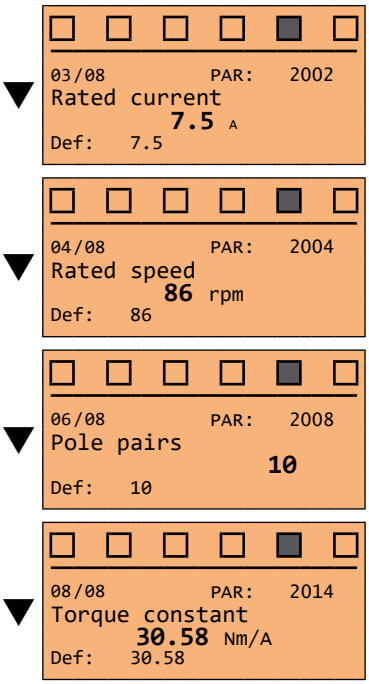
Step 4 – Setting motor data

NOTE!

Def: The factory (default) setting depends on the size of the drive that is connected. These values refer to the ADL5XX-1055.



Range: 230 ... 480V



Range: 1 ... 1500A

Range: 10 ... 32000rpm

Range: 1 ... 60

Range: -

Set the plate data of the motor connected, according to the procedures described on the previous pages.

Rated voltage [V]: the rated voltage of the motor indicated on the data plate.

Rated current [A]: motor rated current; approximately, the value should not be less than 0.3 times the rated current of the drive, output current class 1 @ 400 V on the data plate of the drive.

Rated speed [rpm]: motor rated speed; see data plate.

Pole pairs: Number of motor pole pairs; see data plate.

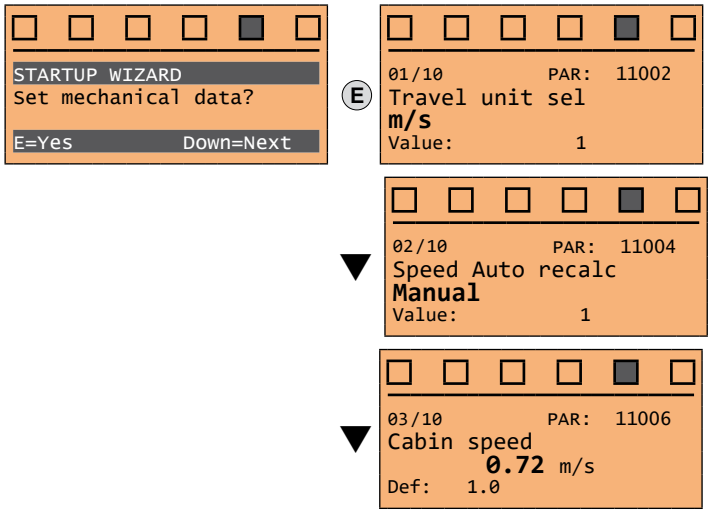
Torque constant [Nm/a]: (KT) Ratio between the torque generated by the motor and the rated current required to supply it.

NOTE!

When data entry is complete the Take parameters command is executed automatically (menu MOTOR DATA, PAR 2020). The motor data entered during the STARTUP WIZARD procedure are saved in a RAM memory to enable the drive to perform the necessary calculations. These data are lost if the device is switched off. To save the motor data follow the procedure described in step 8.

At the end of the procedure proceed to next step.

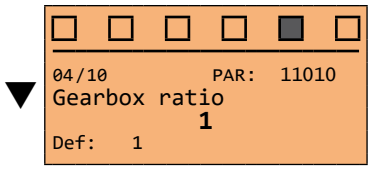
Step 5 – Setting mechanical system data



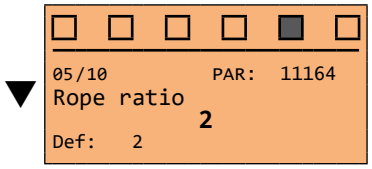
Available selections:
0 Hz (output frequency)
1 m/s (cabin speed)
2 Rpm (motor shaft speed)

Range: 0 ... 1

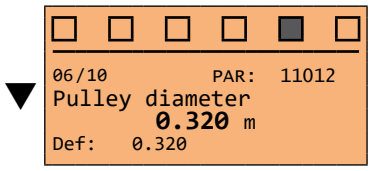
Range: 0 ... 10



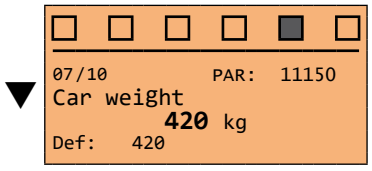
Range: 1 ... 200



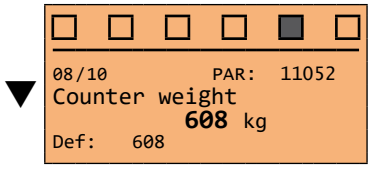
Range: 1 ... 10



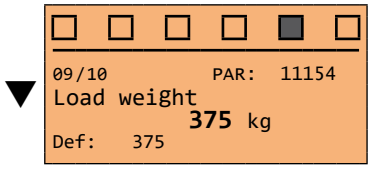
Range: 0 ... 5



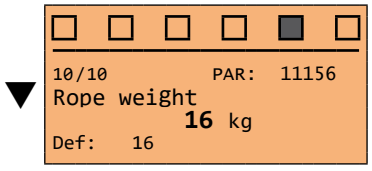
Range: 0 ... 10000



Range: 0 ... 10000



Range: 0 ... 10000

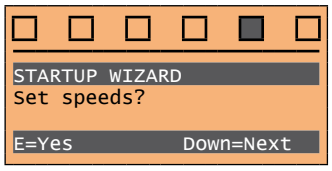


Range: 0 ... 10000

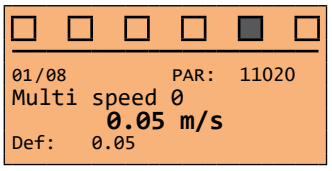
At the end of the procedure proceed to next step.

Step 6 – Setting the system speeds

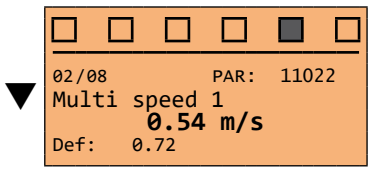
- **Setting multispeed values**



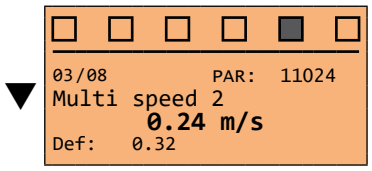
E



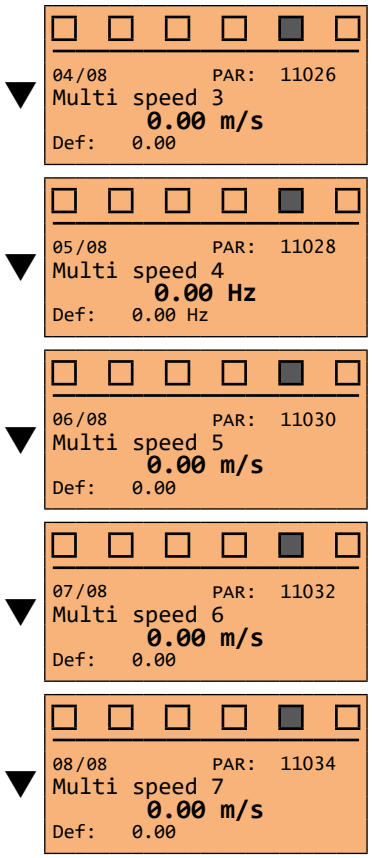
Range: 0 ... 10000



Range: 0 ... 10000



Range: 0 ... 10000



Range: 0 ... 10000

Range: 0 ... 10000

Range: 0 ... 10000

Range: 0 ... 10000

Range: 0 ... 10000

NOTE!

By default, the multispeed 0, 1 and 2 have the values 0.1m/s, 1m/s and 0.45m/s respectively, referring to a cabin speed of 1m/s.

The first three multispeeds take the values of 10%, 100% and 45% of the cabin speed each time the mechanical data is changed unless you set IPA 11004 Auto recalc in mode manual.

In addition, each time mechanical data is changed regardless of IPA value 11004 Speed auto recalc, the drive performs a multispeed congruity check that works as follows:

a) if a multispeed is higher than the rated speed, it is limited to 110% of the latter;

b) if the mechanical values are changed further and the previously limited speeds are now lower than the nominal speed, these multispeeds are not changed (bearing in mind that the first 3 multispeeds always take the values in % unless parameter 11004 is setted how manual).

By entering multispeed values by hand, these are limited to 110% of the car speed, while following a change of mechanical parameters that change the car speed if parameter 11004 Speed auto recalc= auto, the first 3 multispeeds will be reset to the default percentage values.

ATTENTION!

Multi speed configuration table:

Through the combination of "MtlSpd S0" (Digital input 4), "MtlSpd S1" (Digital input 5) and "MtlSpd S2" (Digital input 6) commands, is possible to select Multi speed desired, according to next table:

MtlSpd S2	MtlSpd S1	MtlSpd S0	ACTIVE SPEED
0	0	0	Multispeed 0, PAR 11020
0	0	1	Multispeed 1, PAR 11022
0	1	0	Multispeed 2, PAR 11024
0	1	1	Multispeed 3, PAR 11026
1	0	0	Multispeed 4, PAR 11028
1	0	1	Multispeed 5, PAR 11030
1	1	0	Multispeed 6, PAR 11032
1	1	1	Multispeed 7, PAR 11034

.

At the end of the procedure proceed to next step.

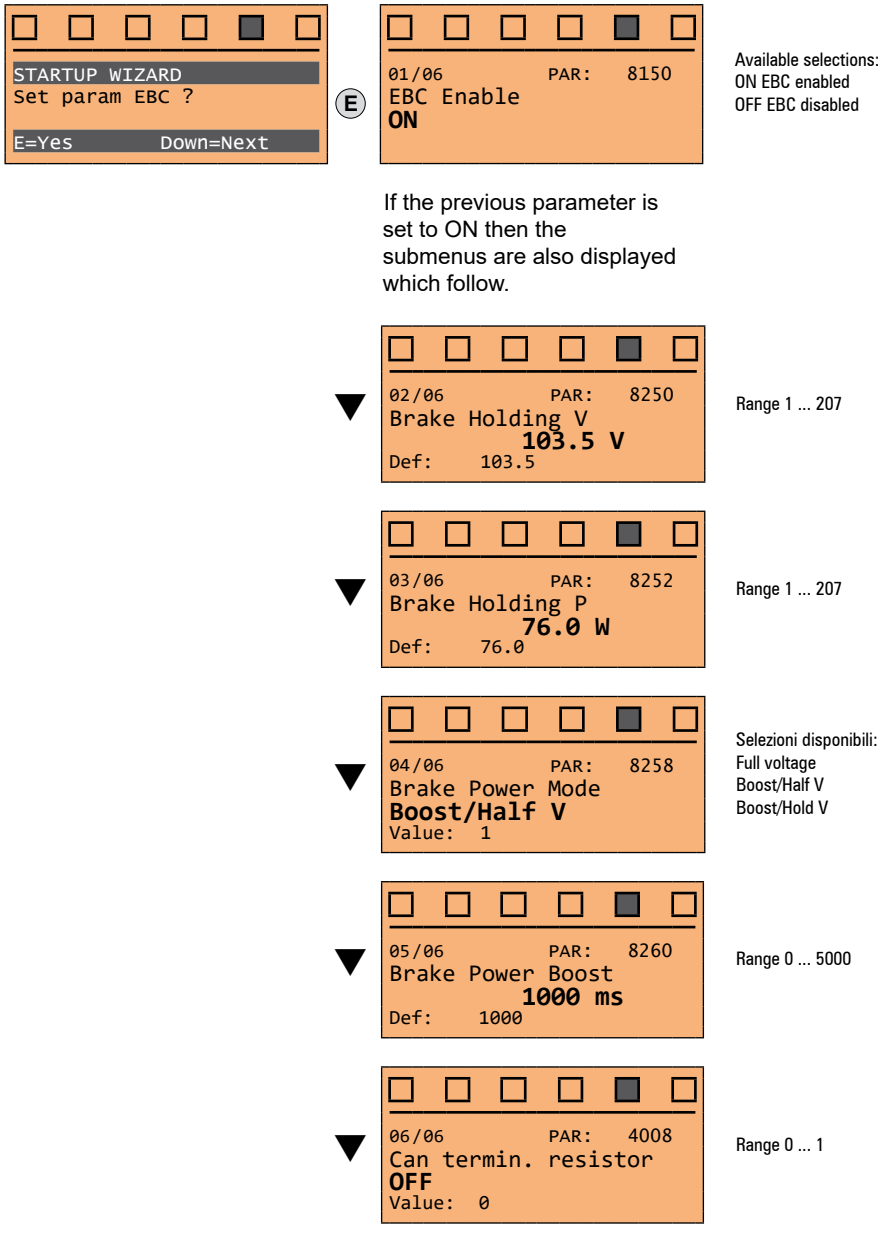
Step 7 - EBC used for asynchronous motor

If you want to have the drive version ADL550 an electronic control brake EBC, putting the EBC activation parameter in ON the menu is expanded and you are asked to enter the parameters of the brake plate: The nominal power and the nominal voltage of the brake during the maintenance phase. If the label had only the power and the nominal voltage at full power then the power value in maintenance to be inserted in the drive is given by the formula:

Pmant =Vmant^2 / Vnom^2 * Pnom

Where:
P mant = Power value in maintenance
V mant = Voltage value in maintenance
P nom = Nominal power
V nom = Nominal voltage

NOTE! Communication with the EBC is only activated after the drive is restarted. Then when the EBC is activated and configured you have to save, restart the drive and then return to the end of this step 6 to continue with the self-learning of the next step.



At the end of the procedure proceed to next step.

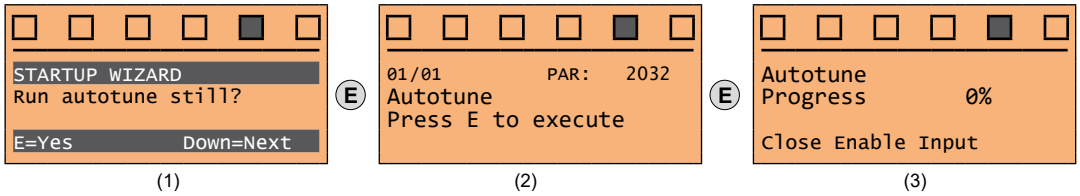
Step 8 – Autotune with motor at stand-still and encoder phasing

The drive carries out the motor autotune procedure (real measurement of motor parameters) and the automatic phasing of the absolute encoder (**the brake must be blocked**).

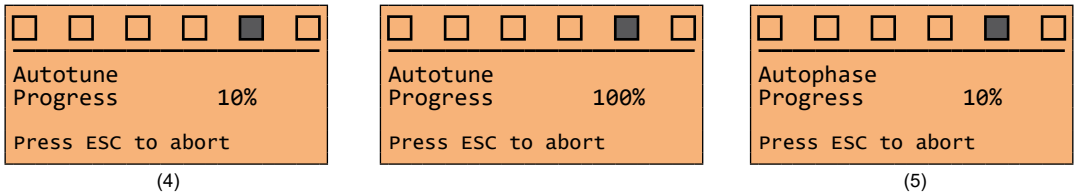
Autotuning may takes a few minutes.

NOTE!

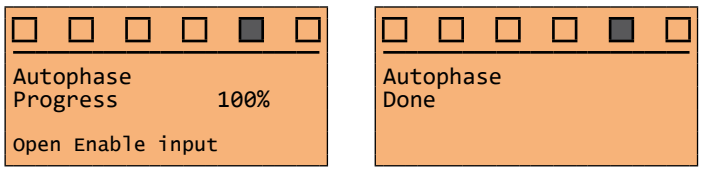
If this operation generates an error message, check the connections of the power and control circuits (see **step 2** - Communication), check the motor data settings (see **step 1** - Setting motor parameters) and then repeat the guided Autotune procedure.



(1) (2) (3)



(4) (5)



(6)

(1) Press the **E** key to proceed to the autotune procedure.

(2) Press the **E** key to start the autotune procedure.

(3) Enable the drive by connecting terminal 9 (Enable) to terminal 12 (+24 V). To abort this operation, press the **ESC** key.

(4) Once the drive is enabled the autotune procedure starts.
This may take a few minutes, depending on the type of motor being used.

(5) The drive now proceed automatically to the absolute encoder phasing.This may take a few minutes, depending on the type of motor being used.

(6) At the end of the procedure the following screen is displayed.
After opening the Enable contact, proceed to next step.

NOTE!

At the end of the autotune procedure there is a request to open the Enable contact (terminals 9 - 12); this results in the automatic execution of the **Take tune parameters** command (menu MOTOR DATA, PAR 2078).

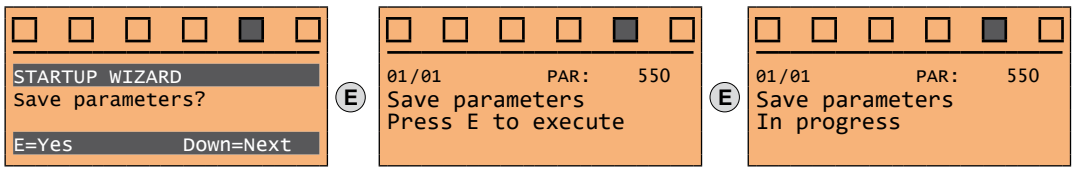
The calculated parameters are saved in a RAM memory to enable the drive to perform the necessary calculations. These data are lost if the device is switched off. To save the motor data follow the procedure described in step 7.

NOTE!

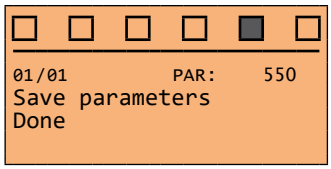
If, after completing the autotune procedure and finishing the start-up wizard mode, an incorrect functioning of the motor is detected (for example, the motor vibrates or tends to stall), it is necessary to repeat the autotune and, if necessary, switch from the static phasing **Mode 1** to **Mode 2** mode by changing setting of parameter 2748 **Still phasing mode**.

Step 9 – Save parameters

To save the new parameter settings, so that they are maintained also after power-off, proceed as follows:



(1) (2) (3)



(4)

(5)

(1) Press the **E** key to start the save parameters procedure.

(2) Press **E** to confirm.

(3) End of procedure.

(4) When the parameters have been saved correctly the drive displays this screen to show that the startup wizard is complete.

9.4 OPTIMIZATION WIZARD

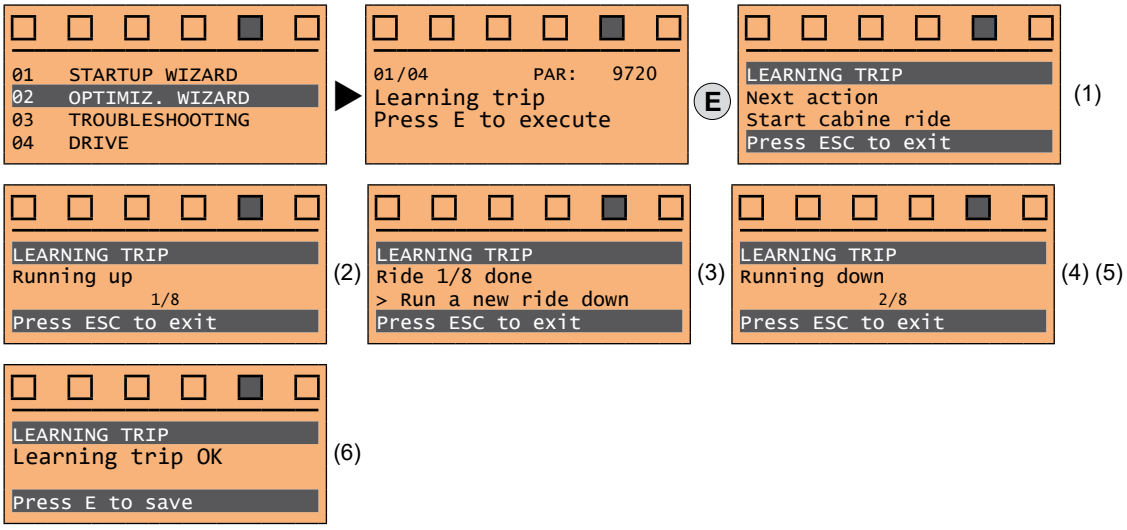
The **OPTIMIZ. WIZARD** is a guided procedure used for immediately optimize the control response in order to maximise cabin comfort.
In addition to the automatic procedure (Learning Trip function), available only if motor has an encoder (control type ASY FOC or SYN FOC), three or five levels of optimization are available for each of the Rollback at start, Rollback at arrival, Comfort low speed, Comfort high speed parameters.
To avoid possible vibrations, the optimization level should not be increased if not necessary.

ATTENTION!

Before enabling the function:

- run the Startup wizard,
- check cabin movement in inspection mode to rule out any macroscopic data entry errors.

The function can be performed from the keypad and via the WEG_DriveLabs configurator (Wizard menu / Optimization Wizard) or by APP..
To facilitate operations, the configurator/keypad suggests what actions are to be performed (e.g. up one floor, down one floor, etc.), intercepting any incorrect actions and communicating them (e.g. call to floor short, calls always in the same direction, etc.) so as to recommend the corrective action.
Once the sequences envisaged by the function have been completed, the basic speed regulator gains are automatically recalculated. Therefore the user can run a test travel to evaluate the improvement in performance obtained and, if still not satisfied, the Learning Trip procedure can be repeated or the deficient aspects improved using the appropriate sections of the optimisation wizard (Rollback at start, Rollback at arrival, Comfort low speed, Comfort high speed).



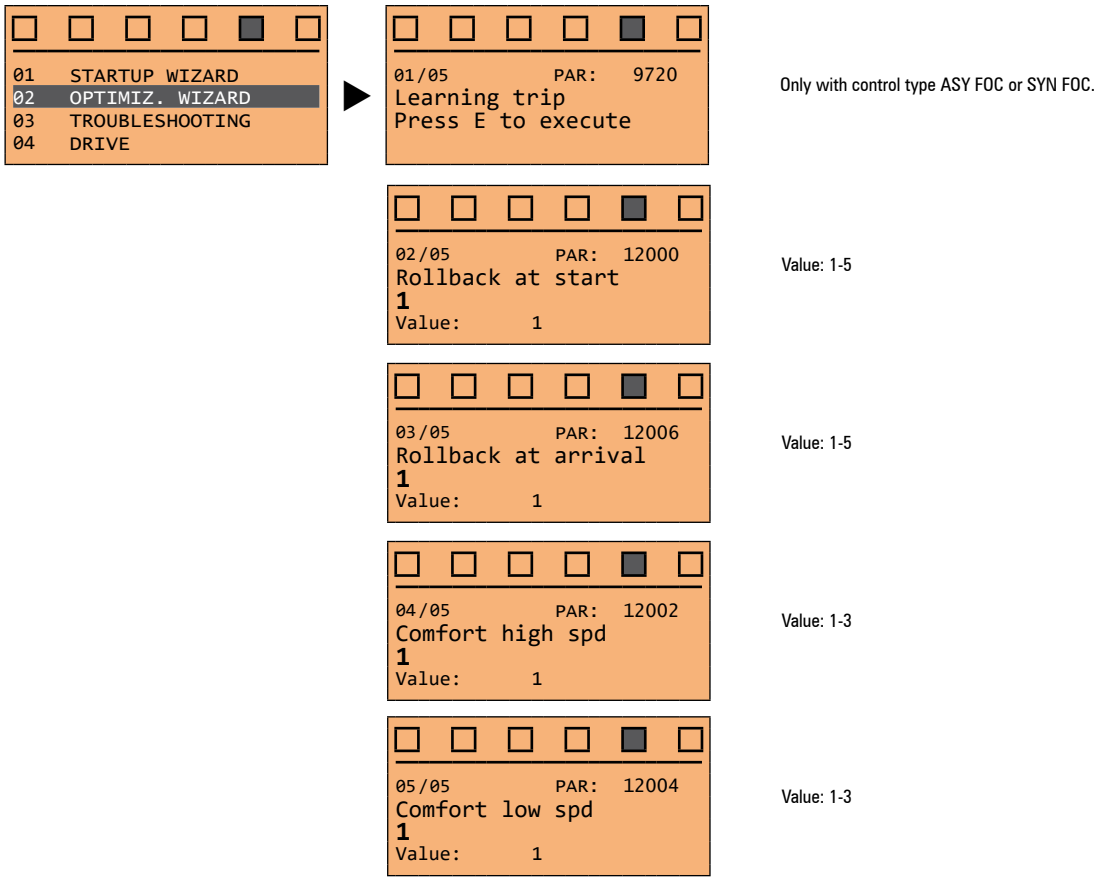
(1) You are prompted to perform the first run (up or down).
(2) Perform the up run.
(3) You are prompted to perform a down run.
(4) Perform the down run.
(5) Repeat the operations (1) (2) (3) (4) several times.
(6) Procedure successfully completed.

Other possible messages:

Procedure not successfully completed. | Short run error. | Wrong direction error.

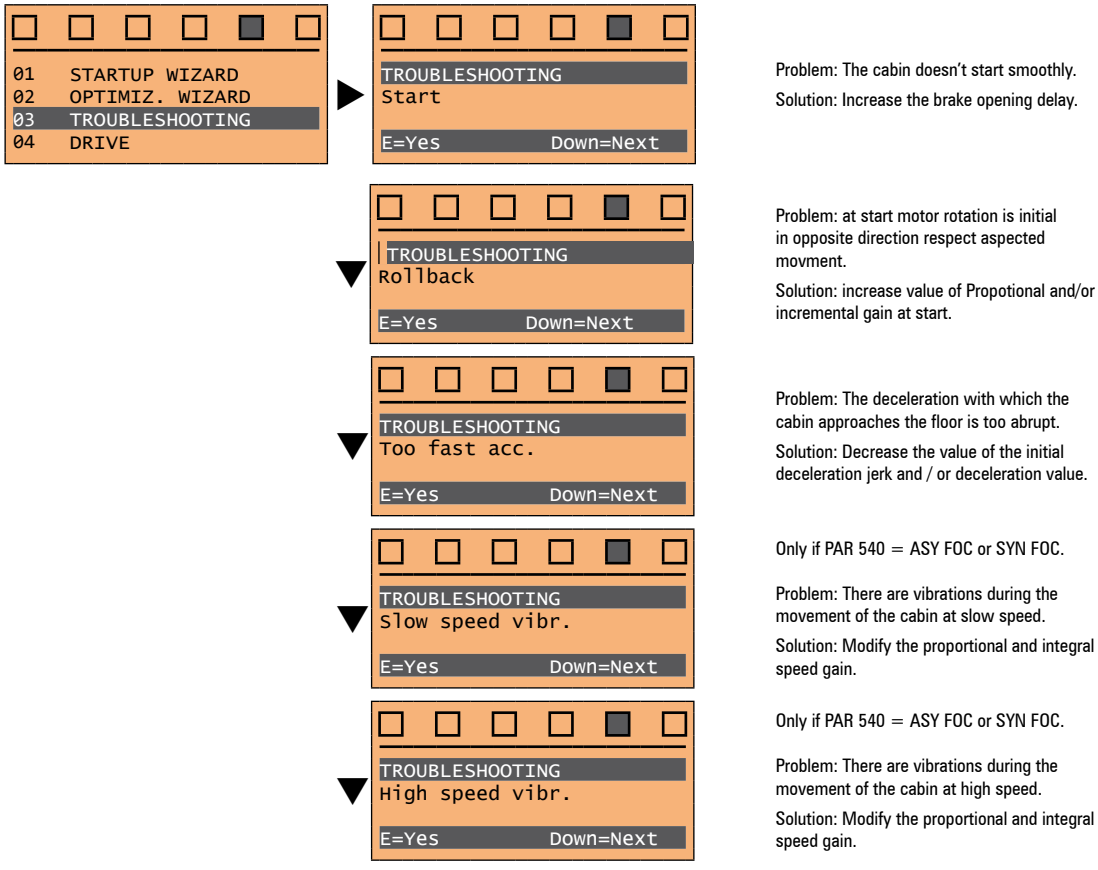
NOTE!

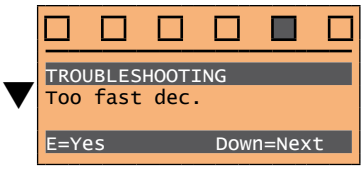
If the message Learned Runs. NOK appears, check that the mechanical parameters entered in the drive are the correct ones, because if the new inertias calculated during optimisation are out of scale, this could be due to incorrect initial mechanical parameters.
Perform optimisation after each change in the static loads on the cabin side or counterweight side.



9.5 TROUBLESHOOTING

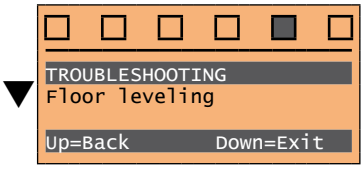
For each typical problem of a Lift System, the parameter of the drive on which to act to solve the problem, are displayed by selecting the relative action.





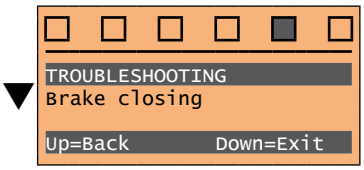
Problem: The deceleration with which the cabin approaches the floor is too abrupt.

Solution: Decrease the value of the initial deceleration jerk and / or deceleration value.



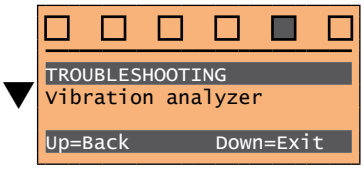
Problem: During the arrival at the floor there is an abrupt stop.

Solution: Decrease the brake closing delay.

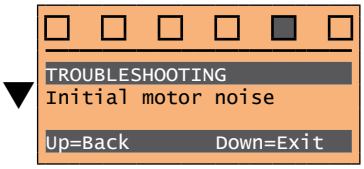


Problem: There is a noise when the brake is closed after the arrival at the floor

Solution: Increase the current down delay

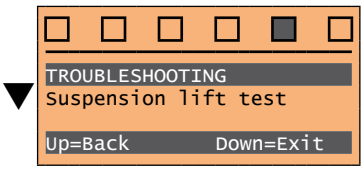


Problem: Vibration analyzer measures system vibration expressed in two most significant resonant frequiencies.
Solution: Values greater than 0 may indicate system vibrations. Typical causes could be intrinsic resonances of the system itself. insufficient guides lubrification, ovalized guides wheels, etc. If you need any advice on vibration damping you can contact after-sale service.



Only for syn motors.

Problem: The motorm akes unwanted tones before starting.
Solution: Switch autophase mode fron default value "each enable" to "first enable".



Execute a suspension slippage test without damaged coveringed strap or ropes.

10 - Troubleshooting

10.1 Alarms

When an Alarm is tripped, the Alarm LED lights up and Alarm appears on the display.

NOTE!

To reset alarms, see paragraph **"8.2.11.1 Alarm reset" .**

In the following table, the Code is visible only from WEG_DriveLabs configurator.

Index	Error message shown on the display	Sub-code	Description
0	**No alarm**	**Condition:** No alarm present	
1	**Overvoltage**	**Condition: DC link overvoltage alarm due to energy recovered from the motor.** The voltage arriving at the drive power section is too high compared to the maximum threshold relating to the PAR 560 **Mains voltage** parameter setting.	
		Solution: - Extend the deceleration ramp. - Use a braking resistor to dissipate the energy recuperation, to be connected to the specific terminals. See section "7.2.1 Power terminals and connection" .	
2	**Undervoltage**	**Condition:** DC link undervoltage alarm. With drive enable, the voltage arriving at the drive power section is too low compared to the minimum threshold relating to the 560 Mains voltage parameter setting due to:. - the mains voltage being too low or overextended voltage drops. - poor cable connections (e.g. loose contactor terminals, inductance, filter, etc.).	
		Solution: Check the connections and mains voltage	
3	**Ground fault**	**Condition:** Ground short circuit alarm	
		Solution: - Check drive and motor wiring. - Check that the motor is not grounded.	
4	**Overcurrent**	**Condition: Instantaneous overcurrent protection intervention alarm.** This may be due to the incorrect setting of current regulator parameters or a short circuit between phases or ground fault on the drive output.	
		Solution: - Check the current regulator parameters - Check wiring towards the motor	
5	**Desaturation**	**Condition: Instantaneous overcurrent in the IGBT bridge alarm.**	
		Solution: - Switch the drive off and then switch it on again. - Check the condition of the braking resistor isolation. Make sure there are no earth leakages. - If the alarm persists, contact the technical service centre.	
6	**MultiUndervolt**	**Condition:** The number of attempted automatic restarts after the **Undervoltage** alarm has exceeded the set **PAR 4650 UVRep attempts** value in the **PAR 4652 UVRep delay** time.	
		Solution: Too many Undervoltage alarms. Adopt the proposed solutions for the **Undervoltage** alarm.	
7	**MultiOvercurr**	**Condition:** 2 attempted automatic restarts after the **Overcurrent** alarm within 30 seconds. If more than 30 seconds pass after the Overcurrent alarm was generated, the attempt counter is reset.	
		Solution: Too many Overcurrent alarms. Adopt the proposed solutions for the **Overcurrent** alarm.	
8	**MultiDesat**	**Condition:** 2 attempted at automatic restarts after the **Desaturation** alarm within 30 seconds. If more than 30 seconds pass after the Desaturation alarm was generated, the attempt counter is reset.	
		Solution: Too many **Desaturation** alarms. Adopt the proposed solutions for the **Desaturation** alarm.	
9	**Heatsink OT**	**Condition:** Heatsink temperature too high alarm	
		Solution: - Verify the correct operation of the cooling fan. - Check that the heatsinks are not clogged - Check that the openings for the cabinet cooling air are not blocked.	
10	**HeatsinkS OTUT**	**Condition:** IGBT module temperature too high or too low alarm	
		Solution: - Verify the correct operation of the cooling fan. - Check that the heatsinks are not clogged - Check that the openings for the cabinet cooling air are not blocked.	
11	**PTC failure**	**Condition:** PTC sensor break alarm. Possible causes: - analog input reading a PTC resistance too low or a short circuit.	
		Solution: Check the connection and integrity of the PTC sensor.	

Index	Error message shown on the display	Sub-code	Description
12	**Motor OT**		**Condition:** Motor overtemperature alarm. Possible causes: - PTC circuit malfunction causing the analog input to see an open circuit with the motor not overheated - Load cycle too heavy - The motor is installed in a place where the ambient temperature is too high - If the motor is provided with a blower: the fan is not working - If the motor is not provided with a blower: the load is too high at slow speeds. Cooling the fan on the motor shaft is not sufficient for this load cycle. - The motor is used at less than the rated frequency, causing additional magnetic losses.
			Solution: - Change the processing cycle. - Use a cooling fan to cool the motor.
13	**Drive overload**		**Condition:** Drive overload alarm. - The inverter output current has exceeded the allowed overload value. - The overload cycle has exceeded the allowed values.
			Solution: - Check that the load is not excessive. - Check that accelerations are not excessive. - Check that the overload cycle is within allowed limits.
14	**Motor overload**		**Condition:** Motor overload alarm. The current absorbed during operation is greater than that specified on the motor data plate.
			Solution: - Reduce the motor load. - Increase the size of the motor.
15	**Bres overload**		**Condition:** Braking resistor overload alarm. The current absorbed by the resistor is greater than the rated current.
			Solution: - Check the size of the braking resistor. - Check the condition of the braking resistor.
16	**Phase loss**		**Condition:** Power phase loss alarm.
			Solution: Check the mains voltage and whether any protections upstream of the drive have been tripped.
17	**Opt Bus fault**		**Condition:** Error in the configuration stage or communication error.
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is equal to 0, the error relates to a communication problem.
		XXXXH-X	If the first digit to the left of "H" in the alarm sub-code is other than 0, the error relates to a configuration problem.
			Solution: For configuration errors, check the configuration of the Bus communication, Bus type, Baudrate, address. parameter setting For communication errors verify wiring, resistance of terminations, interference immunity, timeout settings. For more details reference should be made to the datasheet of the bus being used.
19	**Precharge fault**		**Condition:** Failed precharge relay: the precharge relay contacts are stuck open.
			Solution: Reset the alarm and try to resume normal operation. If the alarm persists, contact technical support.
21	**External fault**		**Condition:** External alarm present. A digital input has been programmed as an external alarm, but the +24V voltage is not available on the terminal.
			Solution: Check that the terminal screws are tight
22	**Speed fbk loss**		**Condition:** Speed feedback loss alarm. The encoder is not connected, not connected properly or not powered: verify encoder operation by selecting the **PAR 260 Motor speed** parameter in the DRIVE MONITOR menu.
			Solution: See parameter 2172 **SpdFbkLoss code** for information about the cause of the alarm and chapter 10.2 **Speed fbk loss** [22] alarm
23	**Overspeed**		**Condition:** Motor overspeed alarm. The motor speed exceeds the limits set in the **PAR 4540** parameter.
			Solution: - Limit the speed reference. - Check that the motor is not driven in overspeed during rotation.
24	**Speed ref loss**		**Condition: Speed reference loss alarm;** occurs if the difference between the speed regulator reference and the actual motor speed is more than the value reported by PAR 4550. This condition occurs because the drive is in the current limit condition. It is only available in the Flux Vect OL and Flux Vect CL mode.
			Solution: Check that: - the load is not excessive. - motor data - encoder parameters - gains - tripping time of the error (PAR 4554) - limit of difference between reference and speed (PAR 4550)
26	**Power down**		**Condition:** The drive was enabled with no supply voltage at the power section.
			Solution: Check drive power supply. If the alarm accour with emergency inout activated then check IPA 448 Emergency UV value: it must be setted how inferior limit admited from auxiliary power supply. Is this value is too near upper value of auxiliary power supply this error accour instead Undervoltage alarm.
27	**Phaseloss out**		**Condition:** Before each start, a test is performed by injecting a small DC current into the motor output phases: if one or more phases are not connected, an alarm is tripped, preventing any movement and opening the brake.
			Solution: Check Drive/motor connection.
28	**OV safety**		**Condition:** Safety status alarm caused by Overvoltage situations.

Index	Error message shown on the display	Sub-code	Description
			Solution: the firmware attemps to reset the card automatically. If the condition is removed (the alarm cleared message is displayed) the alarm can be reset and the drive restarted by deactivating and reactivating Enable and Start.
29	**Safety failure**		**Condition:** The state of the "safety function" is communicated to the regulation card via 2 digital inputs: SAFETY_ON (pin P1.8) and SAFETY_EN (pin P1.9)
			Solution: Switch the drive off and then back on. If the error persists, contact the technical service centre.
30	**Mot phase loss**		**Condition:** One or more motor output power phases missing while motor is turning.
			Solution: Check Drive/motor connection.
31	**Ropes change**		**This may occur in two conditions:** • the drive continues to run but the rope usage threshold set in parameter 3404 **Ropes change thr** has been reached; • the drive finishes the current travel and then locks because parameter 3414 Direction counter has reached 0 (corresponding to parameter 3412 **Ropes usage** = 100%).
			Solution: replace the ropes. By switching the drive off and back on you can run a single travel to bring the car to a better position for the procedure. After you have changed the ropes, reset the direction change counter to eliminate the lock condition.
32	**Enable missing**		**Condition:** (ADL550 only) Occurs if Enable is not activated within 4 seconds of the Safety Enable signal. If parameter 11060 Sequence start stop is set to Start fwd/rev or Start edge F7R mode, then the starting sequence begins with the start command (FED or REV direction) which enables the drive Run contactor output which closes the safe enable input followed by the enable input. For control cards older than version -9 (see PAR 198) a second fast enable input must be connected in parallel with the enable input.
			Solution: • if necessary, check start (FRW or REV) signal • check the SAFETY connector, contacts 1 and 2. • check the Enable signal.. • check the electrical level and Safety Enable signal current capacity. • for drive that mount regulation board befor -9 (see par 198) check if additional fast enable input is configurated and/or cable is connected to fast enable input.
33 ... 48	**Plc1 fault ... Plc16 fault**		**Condition:** Enabled application has found the conditions for generating this specific alarm to be true. The meaning of the alarm depends on the type of installed application. For more information, refer to the documentation concerning the specific application; for EFC application alarm list is also available on par 10.1.1.
		XXXXH-X	The XXXXH-X code indicates the reason for the error: make a note of this to discuss it with the service centre.
			Solution: Refer to the documentation concerning the enabled application. With regards to the standard application EFC refer to follows pharagraph 10.1.1 or to Functional Parameter Manual section 5.10 LIFT ALARMS. For the applications DCP3/DCP4, EPC and CiA 417 refert to the application manual section ALARMS.
49	**Watchdog**		**Condition:** this condition can occur during operation when the watchdog micro protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X	The XXXXH-X code indicates the reason for the error: make a note of this to discuss it with the service centre.
			Solution: If the alarm is the consequence of a change in the drive configuration (parameter setting, option installation, PLC application download) remove it. Turn the drive off and then on again.
50	**Trap error**		**Condition:** this condition can occur during operation when the trap micro protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X	The XXXXH-X (SubHandler-Class) code indicates the reason for the error: make a note of this to discuss it with the service centre.
			Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.
51	**System error**		**Condition:** this condition can occur during operation when the operating system protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X	The XXXXH-X (Error-Pid) code indicates the reason for the error: make a note of this to discuss it with the service centre.
			Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.
52	**User error**		**Condition:** this condition can occur during operation when the software protection is enabled; the alarm is included in the list of alarms and alarm log. After this alarm: - the drive automatically runs a reset - motor control is not available.
		XXXXH-X	The XXXXH-X (Error-Pid) code indicates the reason for the error: make a note of this to discuss it with the service centre.
			Solution: If the alarm was a consequence of a variation to the drive configuration (parameter setting, installation of an option, downloading of a PLC application), remove it. Switch the drive off and then switch it on again.

Index	Error message shown on the display	Sub-code	Description
53	**Param error**	**Condition:** if an error occurs during the enabling of the parameter database saved in the Flash memory; the alarm is included in the list of alarms and alarm log.	
		XXXH-X	Code XXXXH-X indicates the number of the parameter (Hex-Dec) that has caused the error: make a note of this to discuss it with the service centre.
		Solution: Set the parameter causing the error to the correct value and run **Save parameter**. Switch the drive off and then switch it back on again.	
54	**Load default**	**Condition:** this can occur during loading of the parameter database saved in the Flash memory it is normal if it appears in the following conditions: the first time the drive is switched on, when a new version of the firmware is downloaded, when the regulation is installed on a new size, when a new region is entered. If this message appears when the drive is already in use it means there has been a problem in the parameter database saved in the Flash memory. If this message is displayed the drive restores the default database, i.e. the one downloaded during production.	
		0001H-1	The database saved is not valid
		0002H-2	The database saved is not compatible
		0003H-3	The saved database refers to a different size and not to the current size
		0004H-4	The saved database refers to a different region and not to the current region
		Solution: Set the parameters to the desired value and execute **Save parameters**	
55	**Plc cfg error**	**Condition:** this can occur during loading of the MDPLC application The Mdplc application present on the drive is not run.	
		0004H-4	The application that has been downloaded has a different Crc on the DataBlock and Function table.
		0065H-101	The application that has been downloaded has an invalid identification code (Info).
		0066H-102	The applciation that has been downloaded uses an incorrect task number (Info).
		0067H-103	The application that has been downloaded has an incorrect software configuration.
		0068H-104	The application that has been downloaded has a different Crc on the DataBlock and Function table.
		0069H-105	A Trap error or System error has occurred. The drive has automatically executed a Power-up operation. Application not executed. See the Alarm List for more information about an error that has occurred.
		006AH-106	The application that has been downloaded has an invalid identification code (Task).
		006BH-107	The application that has been downloaded uses an incorrect task number (Task).
		006CH-108	The application that has been downloaded has an incorrect Crc (Tables + Code)
		Solution: Remove the MDPLC application or download a correct MDPLC application.	
56	**Load par def plc**	**Condition:** this can occur during loading of the parameter database saved in the Flash memory of the MDPLC application it is normal if it appears the first time the drive is switched on, after downloading a new application. If this message appears when the drive is already in use it means there has been a problem in the parameter database saved in the Flash memory. If this message appears the drive automatically runs the Load default command.	
		0001H-1	The database saved is not valid
		Solution: Set the parameters to the desired value and run Save parameter.	
57	**Key failed**	**Condition:** this can occur at drive power-on if the wrong enabling key is entered for a given firmware function	
		0001H-1	Incorrect PLC key. PLC application not available.
		Solution: Contact WEG to request the key to enable the desired firmware function.	
58	**Encoder error**	**Condition:** This condition may occur when the drive is powered during encoder setup each time parameter 552 **Regulation mode** is set.	
		100H-256	**Cause**: An error occurred during setup; the information received from the encoder is not reliable. If the encoder is used for feedback the **Speed fbk loss** alarm is also generated.
			Solution: Take the recommended action for the **Speed fbk loss** alarm.
		200H-512	**Cause**: The firmware on the optional encoder card is incompatible with that on the regulation card. The information received from the encoder is not reliable
			Solution: Contact WEG in order to update the firmware on the optional encoder card.
59	**Recovery mode**	**Condition:** The firmware was restored via USB from a corrupted flash condition. The restore firmware cannot control the drive but only serves to reactivate basic functions.	
		Solution: Upload official firmware via USB or configurator.	
60	**EBC Fault**	**Condition:** Communication with the EBC has been interrupted for one of the reasons specified in the sub-codes below.	
		Solution: See table below.	

EBC Fault subcode	LABEL	DESCRIPTION
0x0000	ALM_no_alarms	No communication alarm
0x0001	ALM_ng_err_timeout	Time expired in NodeGuarding (line canopen interrupted)
0x0002	ALM_ng_err_generic	Unexpected error in managing NG
0x0003	ALM_ng_err_toggle	Toggle bits in the misaligned NG (serious problems on the canopen communication line)
0x0004	ALM_fail_reset_node	NMT command to reset communication to EBC failed
0x0005	ALM_ebc_missing	Request of "device-type" to EBC failed too many times. EBC NOT PRESENT on canopen line
0x0006	ALM_badline_ebc	Request for "device-type" to failed EBC. Trying recovery

0x0007	ALM_ebc_preop_missing	EBC node timeout at the start of NG and PLC
0x0008	ALM_ebc_product_error	SDO readings for failed EBC product information or inconsistent PRODUCT_TYPE and PRODUCT_CONFIG of EBC
0x0009	ALM_ebc_config_error	Parameters from ADL to EBC were not transferred correctly
0x000a	ALM_ebc_initpdo1	PDO initialization failed
0x000b	ALM_ebc_initpdo2	PDO like SDO initialization failed
0x000c	ALM_ebc_startnode	Start remote node failed
0x000d	ALM_ebc_pdoNo_operative	EBC did not go into operation
0x000e	ALM_ebc_pdos_missing	I have not received PDOs from the EBC
0x000f	ALM_ebc_sys_fault	EBC node restart. Deletion of old PDO failed
0x0010	ALM_fail_stop_node	The stop mode command was sent to the EBC, but the transmission failed
0x0011	ALM_ebc_local_ON	EBC local switch located in local
0x0012	ALM_ebc_crypt_error	Sequence of CRYPT failed
0x0013	ALM_ebc_relocked_error	EBC had passed the CRYPT phase but during the reset or during the EBC ready requires the CRYPT sequence again
0x0014	ALM_ebc_pdoReset_error	Final EBC reset command failed
0x0015	ALM_ebc_NowRemote	EBC with local switch... If I bring it in remote by alarm and stop EBC

10.1.1 EFC application alarms

Index	Error message shown on the display	Description
33	**Cont feedback**	Condition: The contactor feedback signal does not match its command.
		Solution: Check contactor feedback wiring, check logic status of feedback input to drive, increase hold off time (PAR 11202).
34	**Brake Feedback**	Condition: The brake feedback signal does not match its command.
		Solution: Check brake feedback wiring, check logic status of feedback input to drive, increase hold off time (PAR 11206).
35	**Door Feedback**	Condition: The door feedback signal does not match its command.
		Solution: Check door feedback wiring, check logic status of feedback input to drive, increase hold off time (PAR 11212).
36	**Brake Failure**	Condition: Exceeding the Threshold A3 (PAR 11270).
		Solution: Reset alarm using the reset parameter (PAR 11268), check that brake is intact, increase threshold (PAR 11270).
37	**Safe Brake Test**	Condition: Safe Brake Test failed.
		Solution: Check that brake is intact, increase the maximum deviation threshold (PAR 11840).
38	**Speed limit**	Condition: Speed limitation warning to ensure correct landing at floor, it's active when menu distance is used.
		Solution: The distance used is not enough, increase the distance between slow down sensor and floor and update the related distance.
39	**Up/low limit**	Condition: Speed threshold exceeded in limit switches zone (sensors installed at the top and bottom of the lift/elevator shaft).
		Solution: Check speed set in limit switches zone, change speed limit (PAR 11216).
40	**Lift ext fault**	Condition: External alarm signal triggered (PAR 11258).
		Solution: Check causes enabling external alarm signal, increase hold off time (PAR 11266).
41	**EBC fault**	Condition: Intervention of the alarm signal communication with the EBC.
		Solution: Check the physical connection, the presence of termination resistors on both sides of the CAN connection and the configuration of the parameters using the alarm subcodes indicated in QS manual par 10 EBC fault code.
42	**No battery**	Condition: Battery presence alarm.
		Solution: Check that battery is correctly connected to the drive.

10.2 Speed fbk loss alarm according to the type of feedback

Note!

For the correct interpretation of the cause of the alarm trigger, it is necessary to transform the hex code indicated in parameter 15.13 **SpdFbkLoss code,** PAR 2172 , in the corresponding binary and verify in the encoder table that the active bits and related description are used.

Example with encoder Endat:

PAR 2172 = A0H (hex value)

In the table "Speed fbk loss [22] alarm with absolute encoder EnDat" A0 is not indicated in the value column.

A0 should be contemplated as a bitword with meaning A0 -> 10100000 -> bit 5 and bit 7 . The following causes simultaneously intervene:

- Bit 5 = 20H Cause: the SSI signal interferences cause an error in the CKS or parity.
- Bit 7 = 80H Cause: The encoder has detected an incorrect operation and communicates it to the converter through the Error bit. Bits 16..31 present the type of incorrect encoder operation detected.

The value is displayed in hexadecimal format on the optional and standard keypad.

Speed fbk loss [22] alarm with digital incremental encoder

Bit	Value	Name	Description
0	0x01	CHA	**Cause:** no impulses or disturbance on incremental channel A.
			Solution: Check the connection of the encoder-drive channel A, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2104 **Encoder input config**.
1	0x02	CHB	**Cause:** no impulses or disturbance on incremental channel B.
			Solution: Check the connection of the encoder-drive channel B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2104 **Encoder input config**.
2	0x04	CHZ	**Cause:** no impulses or disturbance on incremental channel Z.
			Solution: Check the connection of the encoder-drive channel Z, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2104 **Encoder input config**, check parameter 2110 **Encoder signal check**

Speed fbk loss [22] alarm with sinusoidal incremental encoder

Bit	Value	Name	Description
3	0x08	MOD_ INCR	**Cause:** voltage level not correct or disturbance on signals of incremental channels A-B.
			Solution: Check the connection of the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply,** check parameter 2108 **Encoder signal Vpp.**

Speed fbk loss [22] alarm with SinCos encoder

Bit	Value	Name	Description
3	0x08	MOD_ INCR	**Cause:** voltage level not correct or disturbance on signals of incremental channels A-B.
			Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2108 **Encoder signal Vpp**.
4	0x10	MOD_ ABS	**Cause:** voltage level not correct or disturbance on signals of absolute SinCos channels.
			Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2108 **Encoder signal Vpp**.

Speed fbk loss [22] alarm with SSI absolute encoder

Bit	Value	Name	Description
3	0x08	MOD_ INCR	**Cause:** voltage level not correct or disturbance on signals of incremental channels A-B.
			Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2108 **Encoder signal Vpp**.
5	0x20	CRC_ CKS_P	**Cause:** SSI signals not present or disturbed.
			Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameters 7106 **BiSS N bit ST** and **7108 BiSS N bit MT**.
8	0x100	Setup error	**Cause:** An error occurred during setup.
			Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameters 7106 **BiSS N bit ST** and **7108 BiSS N bit MT**.

Speed fbk loss [22] alarm with EnDat absolute encoder

Bit	Value	Name	Description
3	0x08	MOD_ INCR	**Cause:** voltage level not correct or disturbance on signals of incremental channels A-B.
			Solution: Check the connection of the the encoder-drive channels A-B, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**, check parameter 2108 **Encoder signal Vpp**.
5	0x20	CRC_ CKS_P	**Cause:** SSI signals not present or disturbed cause an error on CRC
			Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**.
8	0x100	Setup error	**Cause:** An error occurred during setup.
			Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**.

The following conditions occur while resetting the encoder following **Speed fbk loss** [22] activation.

Bit	Value	Name	Description			
6	0x40	ACK_ TMO	**Cause:** SSI signals not present or disturbed cause an error on CRC			
			Solution: Check the connection of the clock and encoder-drive data, check the connection of the screen, check the encoder supply voltage, check parameter 2102 **Encoder supply**.			
7	0x80	DT1_ERR	**Cause:** Encoder has detected malfunction and signals this to the drive via bit DT1. Bits 16..31 contain the type of malfunction detected by the encoder.			
			Solution: See the encoder manufacturer's technical guide.			
16.31			**Bit**		**=0**	**=1**
			0	Light source	OK	Failure (1)
			1	Signal amplitude	OK	Erroneous (1)
			2	Position value	OK	Erroneous (1)
			3	Over voltage	NO	Yes (1)
			4	Under voltage	NO	Under voltage supply (1)
			5	Over current	NO	Yes (1)
			6	Battery	OK	Change the battery (2)
			7..15			
			(1) Can also be set after the power supply is switched off or on. (2) Only for battery-buffered encoders			

The following conditions occur while resetting the encoder following **Speed fbk loss** [22] activation.

Bit	Value	Name	Description		
7	0x80	DT1_ERR	**Cause:** Encoder has detected malfunction and signals this to the drive via Error bit. Bits 16..31 contain the type of malfunction detected by the encoder.		
			Solution: See the encoder manufacturer's technical guide.		
16.31			**Type**	**Code**	**Description**
			Transmission	09h	Transmitted parity bit is incorrect
				0AH	Checksum of transmitted data is wrong
				0BH	Incorrect command code
				0CH	Wrong number of transmitted data
				0DH	Illegal transmitted command argument
				0FH	Wrong access authorization specified
				0EH	Selected field has READ ONLY status
				10H	Data field (re) definition not executable due to field size
				11H	Specified address is not available in selected field
				12H	Selected field does not yet exist
				00H	No encoder error, no error message
				03H	Data field operations disabled
				04H	Analog monitoring inoperative
				08H	Counting register overflow

Bit	Value	Name	Description		
				01H	Encoder analog signals are unreliable
				02H	Wrong synchronization or offset
				05H-07H	Encoder-internal hardware fault, no operation possible
				1CH-1DH	Error in sampling, no operation possible
				1EH	Permissible operation temperature is exceeded
			(1) Can also be set after the power supply is switched off or on. (2) Only for battery-buffered encoders		

10.2.1 Reset Speed fbk loss alarm

The reasons for activating the **Speed fbk loss** alarm and the information acquired by the encoder are shown in parameter 2172 **SpdFbkLoss code.**

If no card has been installed the **Speed fbk loss** [22] alarm is generated and no cause is displayed in parameter 2172 **SpdFbkLoss code**. Several causes may be present at the same time.
If no card is recognised, the system runs a routine that always returns **Speed fbk loss** [22] active without specifying a cause.

10.2.2 Encoder error alarm

Setup is performed each time the drive is turned on, regardless of the regulation mode that has been selected. If an error is detected during setup the **Encoder error** alarm is generated with the following codes:

Bit	Value	Name	Description
8	**0x100**	**Setup error**	**Cause:** An error occurred during setup. When this has been signalled the information obtained from the encoder is not reliable.
			Solution: Take the action recommended for **Speed fbk loss** [22] alarm according to the type of encoder.
9	**0x200**	**Compatibility error**	**Cause:** Firmware on option card incompatible with firmware on regulation card. When this has been signalled the information obtained from the encoder is not reliable.
			Solution: Contact WEG in order to update the firmware on the optional card.

10.3 Messages

Note! For more information see chapter **"8.2.12 Messages".**

Index	Error message shown on the display	Sub-code	Description
1	**Load default param**	**Condition:** may occur during loading of the parameter database saved in flash normally appears in the following conditions: at initial power-on when a new firmware version is downloaded, when the regulation is installed on a new size, when the region is changed. If this message is displayed when the drive is already operating, this means that a problem has occurred in the parameter database saved in Flash. If this message is displayed, the drive automatically performs the **Load default** command.	
		0001H-1	The database saved is not valid
		0002H-2	The database saved is not compatible
		0003H-3	The database saved refers to a different size from the current size
		0004H-4	The database saved refers to a different region from the current region
		Solution: Set the parameters to the value required and perform **Save parameter**	
2...4	**Not used**		
5	**Autotune (motor) [SLFT]**	**Condition:** this may occur during the self-tuning procedure	
		0	No error
		1	N.A.
		2	N.A.
		3	The motor plate data parameters have changed but the **Take parameters** command, PAR 2020, has not been executed
			Solution: Execute the **Take parameters** command.
		4	The motor is not connected
			Solution: Connect the motor.
		5	While running self-tuning the ESC key was pressed or the enable contact was opened or an alarm occurred. The self-tuning command was sent with the drive in the alarm condition.
			Solution: Eliminate the reason for the alarm, remove the reason for the opening of the enable contact, reset alarms.
		6	A self-tuning measurement is beyond the drive limits.
			Solution: Check the motor plate data or drive and motor sizes have been combined incorrectly.
		7	The self-tuning command was sent without being enabled.
			Solution: Close the enable contact before sending the self-tuning command.
		8	Error in measuring stator resistance.
			Solution: Check the correct entry of the motor's registration data.
		9	Measured stator resistance above the maximum limit.
			Solution: Check the correct entry of the motor's registration data.
		10	Measured stator resistance below minimum value.
			Solution: Check the correct entry of the motor's registration data.
		11	Calculated a DTL above the maximum limit.
			Solution: Check the correct entry of the motor's registration data.
		12	Calculated a DTL below the minimum limit.
			Solution: Check the correct entry of the motor's registration data.
		13	Calculated a DTS above the maximum limit.
			Solution: Check the correct entry of the motor's registration data.
		14	Calculated a DTS below the minimum limit.
			Solution: Check the correct entry of the motor's registration data.
		15	Timeout in stator inductance measurement.
			Solution: Check the correct entry of the motor's registration data.
		16	Measured stator inductance above the maximum limit.
			Solution: Check the correct entry of the motor's registration data.
		17	Measured a stator inductance below the minimum limit.
			Solution: Check the correct entry of the motor's registration data.
		18	Nominal magnetising current not measured.
			Solution: Check the correct entry of the motor's registration data.
		20	Measured a rotor resistance above the maximum limit.
			Solution: Check the correct entry of the motor's registration data.
		21	Measured rotor resistance below the minimum limit.
			Solution: Check the correct entry of the motor's registration data.
		30	The Enable was not given or removed in time during the phasing procedure.
			Solution: Repeat the phasing procedure and check the connection of the enable signals.

Index	Error message shown on the display	Sub-code	Description
		Solution: If the message appears with a value other than 0, follow the instructions supplied for each particular case and repeat self-tuning. This should be performed using the wizard function available from the keypad (STARTUP WIZARD) and the Tool software on the PC. Pay attention to all motor plate data parameters, especially: - **Rated speed**, **Motor rated speed** in rpm. • (ADL500 for Asynchronous motor) Take care not to set the **Rated speed** parameter to the synchronous speed. The value of the **Rated speed** parameter must be less than: [(**Rated frequency** * 60) / **Pole pairs**]. • (ADL500 for Synchronous motor) Take care to set the **Rated speed** parameter to the synchronous speed. - **Rated frequency**, **Motor rated frequency** in Hz - **Pole pairs**, **Motor pole pairs** If the problem persists even after following the instructions supplied, confirm the values of the motor plate data parameters, execute the **Take parameters** command but not self-tuning.	
5	**Autotune** (phasing) (Only Synchronous) [SLFT]	**0**	No error.
		40	The encoder card in use is not capable of handling automatic timing.
			Solution: Use the appropriate encoder card.
		41	Incorrect incremental encoder pulse count.
			Solution: Check the electrical signals of the incremental encoder. Check the value of the encoder pulse parameter.
		42	Incorrect absolute pulse count.
			Solution: Check the electrical signals of the absolute encoder. Check absolute encoder configuration.
		43	Incorrect incremental encoder pulse counting or incorrect absolute encoder pulse counting, probably caused by an incorrect pole pair parameter value or a load applied to the motor.
			Solution: Check the value of the pole pair parameter, see if a load is applied.
		44	Incorrect incremental encoder pulse count, probably caused by incorrect value of encoder pulse parameter.
			Solution: Check the electrical signals of the incremental encoder. Check the value of the encoder pulse parameter.
		45	Incorrect absolute encoder pulse count.
			Solution: Check the electrical signals of the absolute encoder. Check absolute encoder configuration.
		46	Incremental encoder pulse count sign reversed in relation to absolute encoder pulse count.
			Solution: Invert the A+ and A- signals of the incremental encoder.
		47	Incremental encoder pulse count sign reversed in relation to absolute encoder pulse count.
			Solution: Invert the A+ and A- signals of the absolute encoder.
		48	Incorrect phase sequence. (Message not shown).
			Solution: The automatic procedure changed the setting of the Encoder Direction parameter. No further action is required.
		49	A communication channel between the drive and encoder is activated during automatic timing. An error occurred on this communication channel.
			Solution: Repeat the procedure.
		Solution: If the message has a value other than 0 follow the instructions provided for each case and repeat automatic phasing.	
6	**Power config**	**Condition:** may occur during recognition of power cards. If this message is displayed, it is not possible to drive the motor.	
		0020H-32	The power card is configured for a drive that is incompatible with the regulation card
		0021H-33	The configuration of the power card is not compatible with the regulation card
		0017H-23	The configuration required is not available on the power card
		Solution: Download the correct configuration on the power card	
7	**Save par failed**	**Condition:** during transfer of the parameters from the drive to the memory of the keypado	
		0H-0	Communication error
		0023H-35	Communication error
		0023H-36	Communication error
		0025H-37	The data saved on the keypad are not valid
		Solution: check keypad connection to drive	
8	**Load par failed**	**Condition:** during transfer of the parameters from the memory of the keypad to the drive	

Index	Error message shown on the display	Sub-code	Description
9	Load par incomplete	0H-0	Communication error
		0023H-35	Communication error
		0023H-36	Communication error
		0025H-37	The data saved on the keypad are not valid. No parameter is transferred from the keypad to the drive
		0026H-38	Incompatible drive series. No parameter is transferred from the keypad to the drive
		0027H-39	Different software version. All the parameters present in the memory of the keypad have been transferred to the drive. The set of parameters transferred refers to a drive with a different firmware version; therefore, certain parameters may not be updated.
		0028H-40	Incompatible drive size. All the parameters present in the memory of the keypad (excluding those that depend on the size of the drive), have been transferred to the drive. The parameters that depend on size maintain their original value.
		0029H-41	Error during saving of parameters on the drive. All the parameters present in the memory of the keypad have been transferred to the drive. The transfer of one or more parameters has caused an "out of range" error, or one or more parameters does not exist. At the end of transfer, one or more parameters may not have been updated.
		002AH-42	Different PLC application release and version. All parameters in the keypad memory have been transferred to the drive. The transferred set of parameters relates to a drive with a PLC application in which the version and release of the application are different. As a result some of the PLC application parameters may not be updated.
		002BH-43	PLC application not compatible. All the parameters in the keypad memory except those relating to the PLC applciation have been transferred to the drive. The transferred set of parameters relates to a drive with a different PLC application. As a result none of the PLC application parameters are updated.
		Solution: Recover a set of parameters from a compatible drive (model and size)	
10	Not used		
11	Load def plc	**Condition:** may occur during loading of the parameter database saved in the Flash of the Mdplc application Normally appears at initial power-on after downloading a new application. If this message is displayed when the drive is already operating, this means that a problem has occurred in the parameter database saved in Flash. If this message appears the drive restores the default database, i.e. the one that was downloaded.	
		0001H-1	The database saved is not valid
		Solution: Set the parameters to the value required and perform **Save parameter**	
12	Plc cfg error	**Condition:** may occur during loading of the Mdplc application The Mdplc application present on the drive is not run.	
		0004H-4	The application downloaded has a different Crc on DataBlock and Function table
		0065H-101	The application downloaded has an invalid identifier (Info)
		0066H-102	The application downloaded has an incorrect task number (Info)
		0067H-103	The application downloaded has an incorrect software configuration
		0068H-104	The application downloaded has a different Crc on DataBlock and Function table
		0069H-105	A Trap error or System error has occurred. The drive automatically performs a Power-up operation. The application is not run. See in Alarm List for further information regarding the error occurred
		006AH-106	The application downloaded has an incorrect identifier (Task)
		006BH-107	The application downloaded has an incorrect task number (Task)
		006CH-108	The application downloaded has an incorrect Crc (Tables + Code)
		Solution: Remove the Mdplc application or download a correct Mdplc application	
13	Plc 1	Reserved messages and dedicated to the PLC application. See the application manual.	
14	Plc 2		
15	Plc 3		
16	Plc 4		
17	Opt bus fault	**Condition:** this may occur when the drive is turned on, during fieldbus card setup. Error during configuration or communication error.	
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is 0, the error regards a communication problem.
		XXX0H-X	If the first digit to the left of "H" in the alarm sub-code is other than 0, the error regards a configuration problem.
		Solution: For configuration errors, check the configuration of the bus communication, type of bus, baudrate, address, parameter setting For communication errors, check wiring, termination resistors, disturbance immunity, timeout settings. For further details, please refer to follow table or refer to the guide for the specific bus.	
18	Wrong key	**Condition**: this may occur when powering the drive, if the incorrect enable key is inserted for a given firmware function.	
		xxxxH-x	
		Solution: Ask WEG to supply the correct key to enable the desired firmware function.	
19	Key expiring	**Condition:** this may occur at drive power-on if the incorrect enabling key was inserted for a given firmware function. At this stage the firmware function can still be used freely, but this time limit is about to expire	
		xxxxH-x	Number of hours for which the function can still be used freely.
		Solution: Ask WEG for the correct key to enable the desired firmware function.	
20	Not used		

Index	Error message shown on the display	Sub-code	Description
21	**Parameter error**	**Condition:** if an error occurs during activation of the parameter database saved in flash; the alarm is inserted in the alarm list and alarm log.	
		XXX0H-X	Code XXXXH-X indicates the number of the parameter (Hex-Dec) that has caused the error: make a note of this to discuss it with the service centre.
		Solution: Set the parameter that has caused the error to the correct value and execute **Save parameters**, switch the drive off and then back on.	
22	**Encoder error**	**Condition:** this condition may occur when the drive is powered during encoder setup each time parameter 552 **Regulation mode** is set.	
		100H-256	**Cause**: An error occurred during setup; the information received from the encoder is not reliable. If the encoder is used for feedback the **Speed fbk loss** alarm is also generated.
			Solution: Take the recommended action for the **Speed fbk loss** alarm.
		200H-512	**Cause**: The firmware on the optional encoder card is incompatible with that on the regulation card. The information received from the encoder is not reliable
			Solution: Contact WEG in order to update the firmware on the optional encoder card.
23	**Not used**		
24	**Fw update failed**	**Condition:** When updating the firmware, check whether the file is in the wrong format or corrupt.	
		Solution: try again with a correct file.	
25	**USB Error**	**Condition:** A parameter (*) requiring insertion of a USB flash drive has been run, but the drive has not been inserted. (*): PAR 392 **Select motor,** PAR 596 **Save to USB,** PAR 598 **Load from USB,** PAR 1560 **WebApp Update,** PAR 3434 **Save rope to USB,** PAR 3436 **Load rope from USB**.	
		Solution: Insert a USB flash drive containing any files required by the parameter for its execution.	

OPT bus fault Alarms subcode

Error codes referring to error 17 OPT Bus Fault.

Code	Description	Actions
0	Bus Loss	Check line for noise, terminations , problems with cabling
FF01	Fieldbus type does not match expansion card	Please contact Technical Assistance.
FF02	Wrong baudrate selected	Check “Fieldbus baudrate” is one of 125k, 250k, 500k, 1M
FF03	Invalid address for node	Check “Fieldbus address”
FF04	Error initializing CAN interface	Internal error, contact manufacturer
FF14..FF23	Wrong object selected for mapping in channel M2S n	Check “Fieldbus M->Sn Dest
FF24..FF33	More than 1 Src pointing to M2S Channel n	Check for multiple destinations on “Fieldbus M->Sn Dest”
FF34..FF43	M2S Channel n , data size is wrong (16 bits on 32 bits or 32 bits on 16 bits parameter)	Check “Fieldbus M->Sn sys”
FF44..FF53	Invalid parameter in channel S2M n	Check “Fieldbus S->Mn src”
FF54..FF63	S2M Channel n , data size is wrong (16 bits on 32 bits or 32 bits on 16 bits parameter)	Check “Fieldbus S->Mn sys”
FF64..FF73	Wrong object selected for mapping in channel S2M n	Check “Fieldbus S->Mn src”
FF74..FF83	M2S Channel n : too many words in PDC	“Fieldbus M-Sn dest” & “Fieldubs M->Sn sys” address more than 16 words in PDC
FF84..FF93	S2M Channel n : too many words in PDC	“Fieldbus S->Mn src” & “Fieldubs S->Mn sys” address more than 16 words in PDC
FFB4..FFC3	Internal database error on channel n	Internal error, contact manufacturer
8100	Bus off	Too many repeated hardware communication errors; check hardware connections and presence of terminal resistance on both sides of CAN BUS cable
8110	CAN msg overflow	Too many packets for selected baudrate
8130	LifeGuard/HeartBeat error	Software timeout from master
FFC5	Wrong NMT message length	Check NMT packets
FFC6	Invalid NMT command	Check NMT packets
FFC7	CAN bus off	Check line state for problems

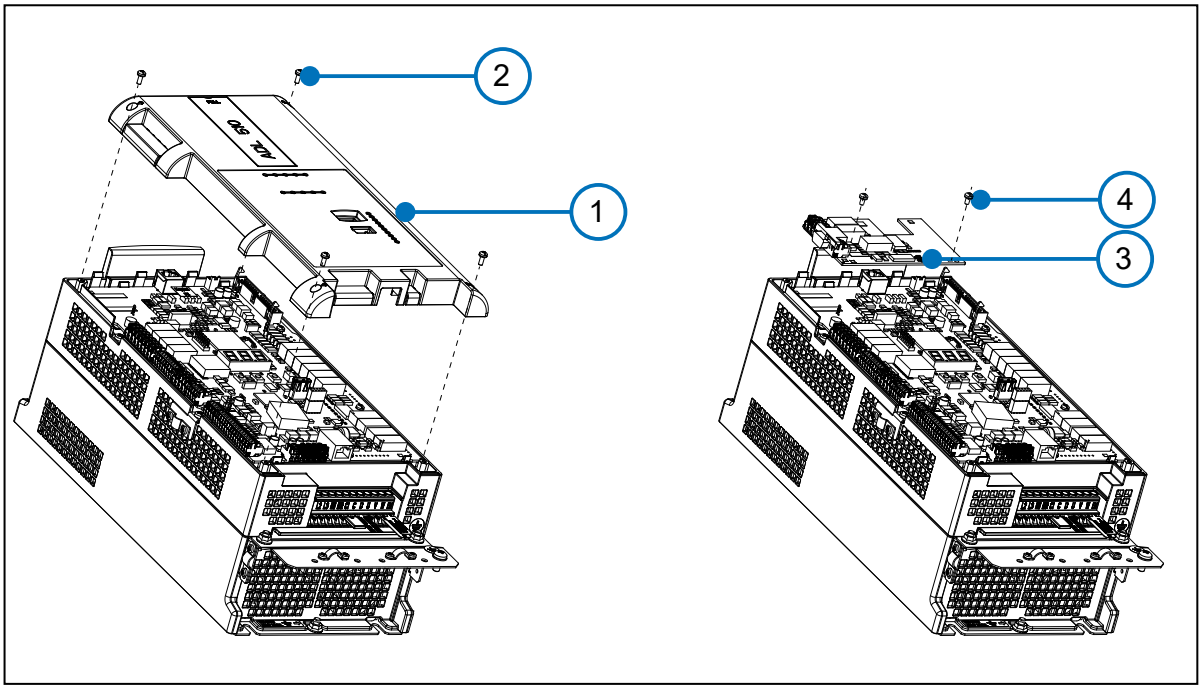
A.1 - Optional cards

A.1.1 - Installation

Only one option card can be installed, either an **EXP-IO1-ADL500** or an **EXP-DCP-ADL500.**

CAUTION!

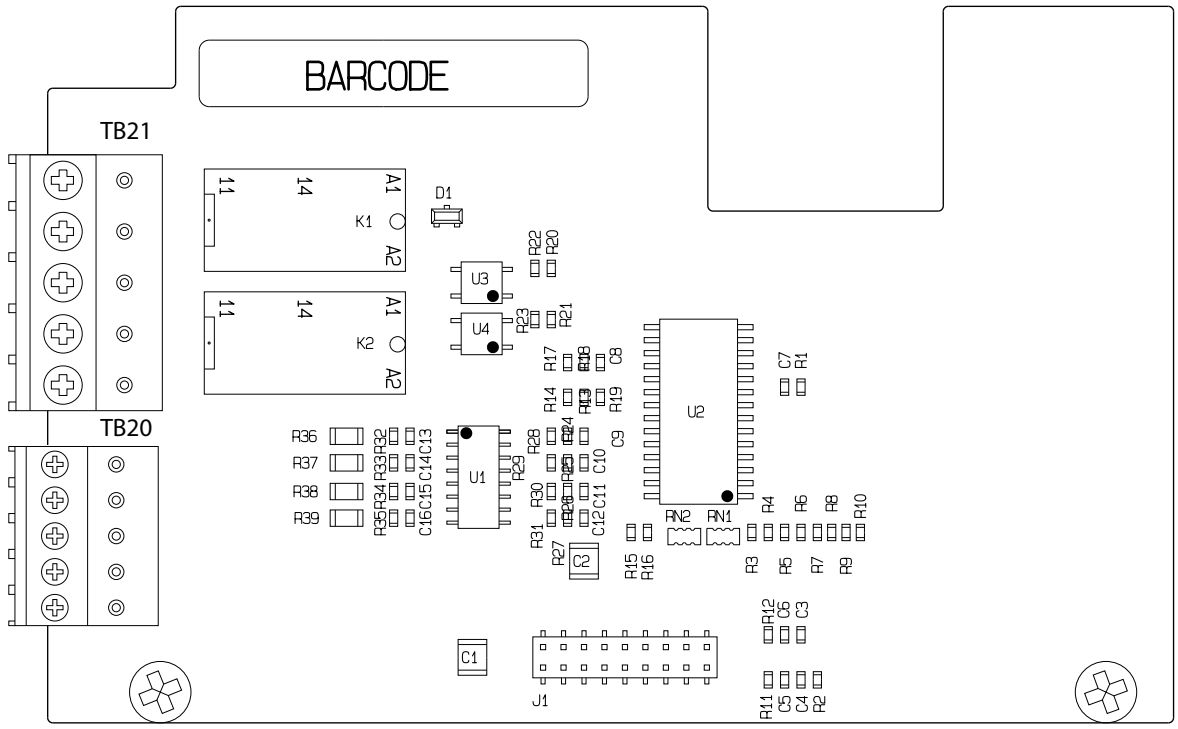
Use only the screws supplied with the option card.



(1) Use a Phillips screwdriver (Ph2) to loosen the 4 M3 screws (2) and then remove the top cover (1);
(2) Secure the optional board (3) by inserting the option board's J1 female connector onto the control board's P13 male connector;
(3) Tighten down the 2 M3 (4) screws supplied with the option board (3);
(4) Replace the upper cover (1) and tighten down the 4 M3 screws (2).

A.1.2 - Optional card EXP-IO1-ADL500

Optional expansion card (code S5DL408, for ADL550 only), adds 4 digital inputs (DI) and 2 relays outputs (RO) to the basic configuration.



TB21 terminal – Digital Relays Output

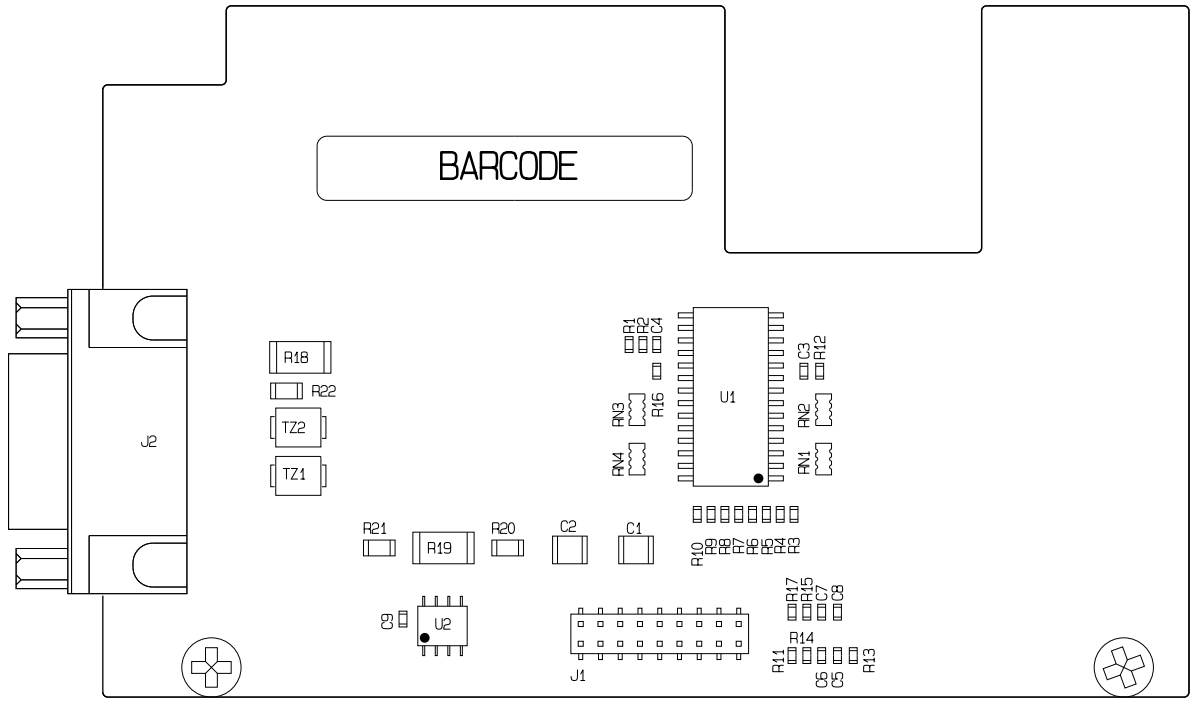
Pin	Signal	Description	*Command* Associated parameter
58	**RO_6O**	Output Relay 6 (N.O. contact, 250VAC /30VDC, 2A)	**1422, Dig output 2X src**
59	**RO_6C**	Common Relay 6	
60	**RO_5O**	Output Relay 5 (N.O. contact, 250VAC /30VDC, 2A)	**1420, Dig output 1X src**
61	**RO_5C**	Common Relay 5	
62	**-**	Not connected	

TB20 terminal – Digital inputs

Pin	Signal	Description	*Command* Associated parameter
13	**DI_4X**	Digital input 4X	-
14	**DI_3X**	Digital input 3X	-
15	**DI_2X**	Digital input 2X	-
16	**DI_1X**	Digital input 1X	-
17	**DI_CM**	Digital input common reference	-

A.1.3 - Optional card EXP-DCP-ADL500

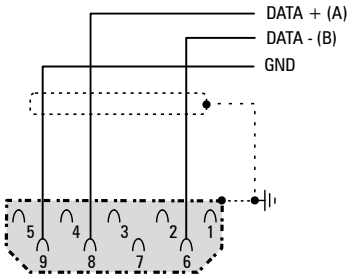
Optional expansion card (cod. S5DL434, for ADL550 only) for remote control through the DCP3 protocol for use in velocity mode (in preparation) or through the DCP4 protocol for use in position mode (in preparation).



J2 DSUB 9-pin female cup connector

Pin	Signal
1	n.c.
2	n.c.
3	n.c.
4	n.c.
5	n.c.
6	DATA - (B)
7	n.c.
8	DATA + (A)
9	REF (GROUND)

For the connection reference should be made to the DCP specifications (see next screen).



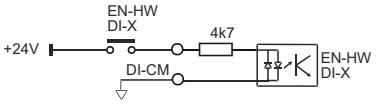
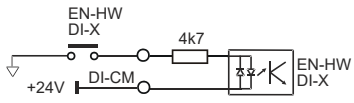
CAUTION!

The connection have no galvanic isolation!

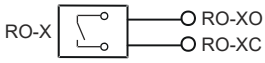
A.2 - Input/Output features

External supply	
Voltage	+24 Vdc
Tolerance	±10%
Maximum current	300 mA

- **Digital inputs (DI) and enable hardware inputs (EN-HW)**

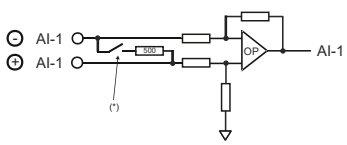
Description	Features
Type	24 V PNP / NPN
Operating voltage	0 V to + 24 V (+ 30 V max)
Load	5 mA @ +24 V - R_L = 4.7 kΩ
Thresholds	V_{IC} < 5 V – V_{IH} > 15 V
Isolation	Yes – Functional (> 1 kV)
PNP	NPN
	

- **Relay outputs (RO)**

Description	Features
Type	NO Relay (single contact)
Operating voltage	110 Vac / 30 Vdc / 2 A
Load	50 mA @ +10 V
Isolation	Yes – 4 kV
	

If one or more relay outputs are used in extra-low voltage circuits (up to 30 Vdc) and at the same time low voltage (110 Vac) relay outputs are used, then reinforced isolation is required for the extra-low voltage circuits, i.e. they must not be accessible to operators and users, and their power supply must not be taken from the 24 Vdc supply provided by the drive.

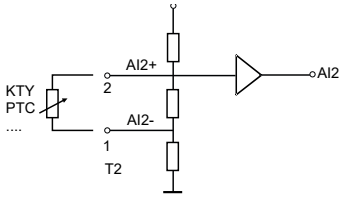
- **Analog input AI1**

Description	Features
Type	Voltage differential
Input voltage	±10 Vdc (±12.5 Vdc full scale)
Input R	10 kΩ
Resolution	12 Bits (11 + sign)
Precision	1% of full scale
Isolation	NO
Description	**Features**
Type	Current differential
Input current	0 (4) mA to 20 mA
Input R	500 Ω
Resolution	12 Bits (11 + sign)
Precision	1% of full scale
Isolation	NO
	

(*) Select input V/I (V=OFF, I=ON)

- **Analog input AI2 (External PTC or KTY sensor)**

Description	Features
Type	Voltage
Input voltage	from 120 mV to 2.55 V
Input R	2 kΩ
Resolution	12 Bits
Precision	1% of full scale
Isolation	NO



NOTE!

It is permitted to connect to the drive only PTC or KTY whose connection circuit and probe housing are made entirely in double insulation

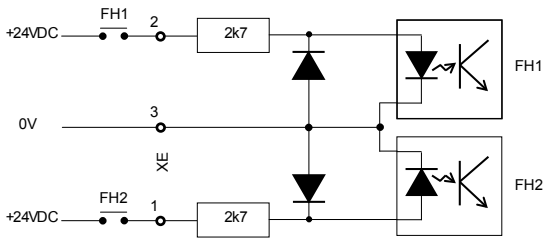
If, as a motor thermal, a PTC is used, the limits that trigger the alarms are as follows:

- for resistors above 5kohm +- 5% the alarm of overterperature is triggered;
- for resistances below 100ohm +-5% the PTC fault alarm is triggered.

In case the motor had a thermal pad type ON-OFF then this analog input can be used by connecting in series to the thermal pad a 1kohm resistance.

- **Fast Input Inputs (Freeze)**

Description	Features
Type	24 Vdc PNP Input
Input voltage	0 to + 24 Vdc (+30 Vdc max)
Load	8 mA @ 24 Vdc, RL = 2.7 kΩ
Thresholds	V_{IL} < 2V, V_{IH} > 19 V
Isolation	Yes, functional (>1 kV)



- **STO Input signal (Safe Torque Off)**

Description	Features
Type	24 Vdc
Operating voltage	0 to + 24 Vdc (+36 Vdc max)
Load	20 mA @ +24 Vdc - R_L = 1.32 kΩ
Thresholds	V_{IC} < 5 Vdc – V_{IH} > 18 Vdc
Isolation	Yes, functional (>1 kV)

- **STO Output signal (Safe Torque Off)**

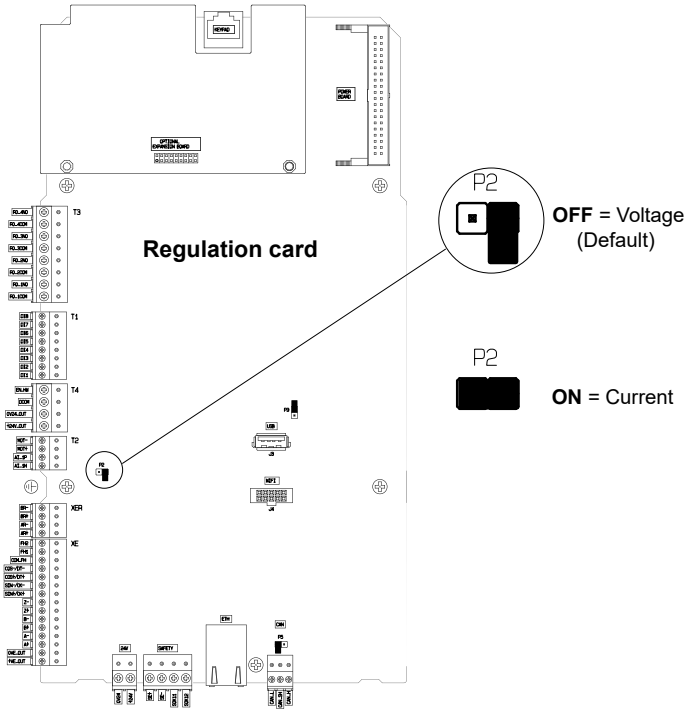
Description	Features
Type	24 Vdc or 110 Vac
Operating voltage	0 to+ 24 Vdc or 0 to + 110 Vac
Load	250 mA @ +24 Vdc or 250 mArms @ 110 Vac
Thresholds	V_{IC} < 5 Vdc – V_{IH} > 18 Vdc

A.2.1 Selection of Voltage/Current at analog input AI1

Analog input 1 is factory set for differential voltage signals (-10 V..+10 V).

To change the input type (0...10 V, 0...20 mA, 4...20 mA) it is necessary to change the (PAR 1602 **Analog inp 1 type**, menu ANALOG INPUTS) parameter setting and the position of P2 Jumper as shown in the figure.

To access the Regulation card, remove the top cover, see section "A.1 - Optional cards".



A.3 Windows PC Network Configuration

PC's Ethernet configuration must be set consistently with ADL500 Ethernet configuration, so that the PC and ADL500 can communicate.
Usually PC's are set in DHCP mode, so they request the network for an IP address. In case no DHCP server is available in the network, in most cases PC's autonomously acquire an IP address belonging to "link local" family: 169.254.x.y.
If the PC's Ethernet configuration has to be modified, for example in case of ADL500 static IP configuration, here are the operations to do:

For Windows XP under Control Panel → Network Connections
For Windows 7 under Control Panel → Network and Sharing Center -> Change adapter settings
For Windows 10 and 11 under Control Panel → Network & Internet -> Change your network settings -> Change adapter options

Then right click on the network adapter to be configured, select "Properties", double click on "Internet Protocol TCP/IP" (for Windows XP) or "Internet Protocol Version 4 (TCP/IPv4) (for Windows 7, Window 10 or Windows 11).

By default, under "General" Tab, the radio button "Obtain an IP address automatically" should be selected. With this selection, the PC requests the IP address from the DHCP network.
If under "Alternate Configuration" the "Automatic private IP address" is selected, PC will acquire a link local address (169.254.x.y), if no DHCP server is available in the network.

Changing the selection of the radio button to "Use the following IP address" the PC will be configured with a static network configuration. Value of fields:

- IP address
- Subnet Mask
- Default Gateway

must be set to be compatible with ADL500 network configuration and thus enable communication.

A.4 - Brake monitoring system

A.4.1 Introduction

The brake monitoring function in the ADL500 series of products enables implementation of the automatic brake monitoring function as required by EN 81-20:2020 section 5.6.7.3.

Two functional elements are required to implement the brake monitoring function:
1. Management of the **Brake fault** alarm;
2. Resetting of the **Brake fault** alarm.

The basic wiring diagram for implementing this function is shown in the figure below.

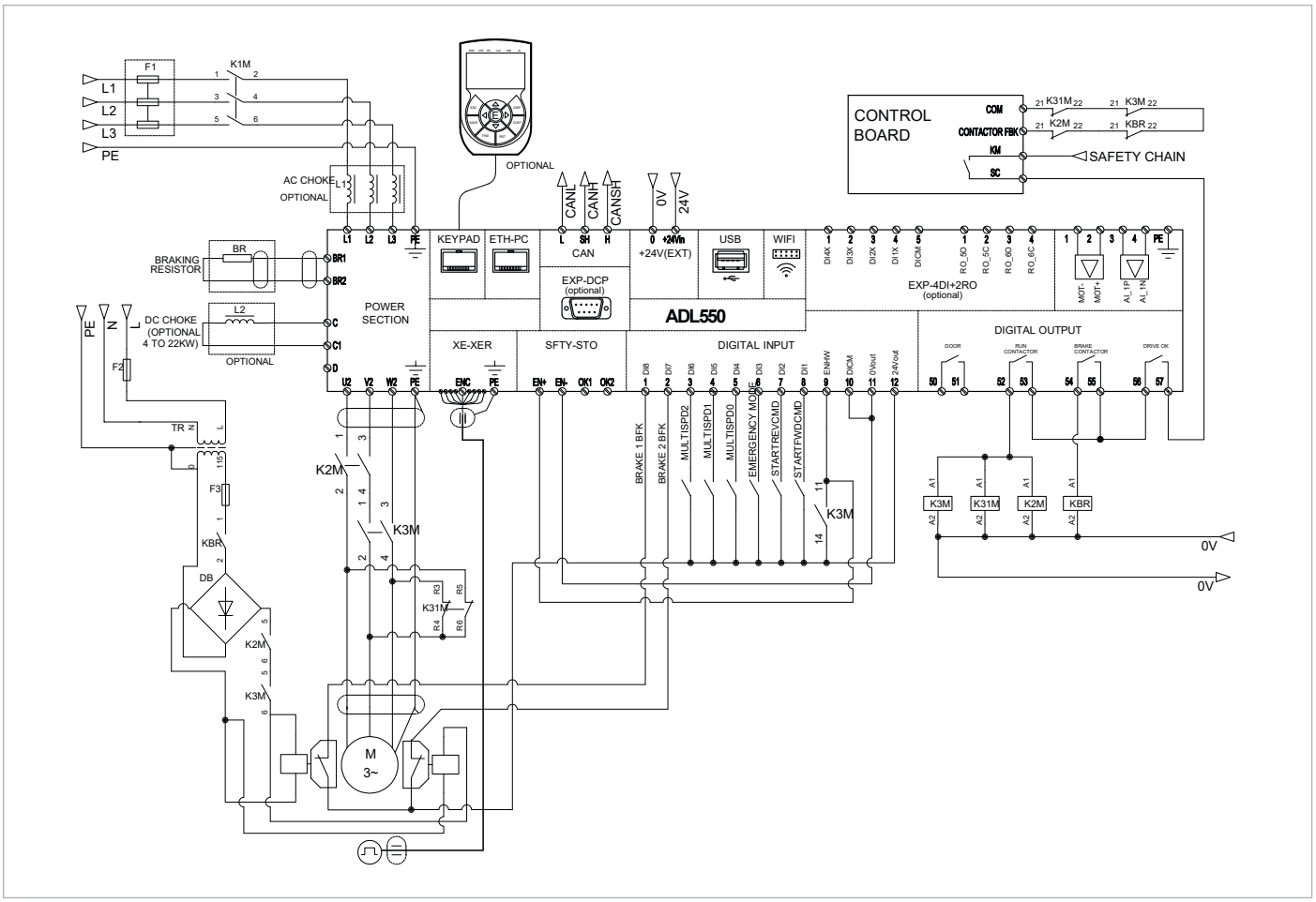


Figure A.4.1.1: ADL550 connection diagram for brake monitoring

This shows that:

A) The ADL500 controls brake activation/deactivation via relay BR
B) Both brake feedback signals are sent to the ADL500 inputs
C) The ADL500 signals any malfunctions (including brake malfunctions) to the system control unit via internal relay DRIVE OK.
D) The system control unit blocks the system brake in safety by deactivating contactors K2M and K3M.

According to an alternative arrangement, the ADL500 closes/opens contactors K2M and K3M but the power supply to the coils and to the ADL500 commands comes from the external, i.e. a control unit.

The purpose of the brake fault alarm is to check whether the states of the two feedback signals from the brake are consistent and, in case of doubt, to include a function whereby the ADL500 drive stops the system. The procedure for including the alarm is described below.

A.4.2 Configuration of the brake fault alarm

- **Activation of the brake fault alarm function**

The installer must have previously located the necessary digital inputs of the ADL500 drive and connected the corresponding wires to the feedback signals on these inputs. Note that depending on the type of wiring arrangement, the brake feedback signals are normally asserted (brake closed – digital input to 1) or normally not asserted (brake closed – digital input to 0).
The brake fault alarm function envisages signals that are normally asserted. If the wiring is functionally inverted, simply negate the corresponding digital inputs in the ADL500 configuration.

To configure the brake fault alarm function, proceed as follows:

1. In the SAFETY menu , change the setting of parameter 11252 **Brake Fbk A3 Sel** (default **Null**) and select the digital input corresponding to the second brake feedback signal If **Brake Fbk A3 Sel** is set to a value other than **Null**, the brake fault alarm function is automatically enabled.
2. Next select the digital input corresponding to the first brake feedback signal in parameter 11236 **Brake fbk src** (menu LIFT IN).

The brake fault function is enabled. **The installer in charge of the system must test the function each time it is activated or modified, following the brake fault test procedure.**

- **Resetting the brake fault alarm**

For FW versions before 3.1.10:

1. Open the LIFT ALARM menu and check the setting of parameter 11204 **Brake activity** = Disable.
2. In the SAFETY menu, select parameter 11268 **Reset Brake Alarm** (default 0).
3. The system asks for a code, enter release code 5313.
4. Check again to see whether the **Brake Alarm** has been reset.

For FW versions from 3.1.10:

1. Open the LIFT ALARM menu and check the setting of parameter 11204 **Brake activity** = Disable.
2. Reset alarm by **RST** button on keypad.
3. Check gain to see whether the **Brake Alarm** has been reset.

- **Disabling the brake fault alarm**

1. In the SAFETY menu, change the setting of parameter 11252 **Brake Fbk A3 Sel** to **Null** The brake fault alarm function is disabled.
2. If the new configuration does not manage any brake feedback signals, change the setting of parameter 11236 **Brake Fbk Sel** (menu LIFT IN) to [3708] **Brake cont mon**.

- **Brake fault alarm test procedure**

Proceed as follows:
1. Disconnect the wire connecting the first brake feedback signal to the relative digital input.
2. Try re-starting from the floor with the feedback signal disconnected. If the lift car does not move (correct behaviour), proceed to step 3. If the lift car moves, the alarm is not working properly. Check the various parts of the system.
3. If the brake fault alarm is connected, reset it and proceed to step 4. If the alarm is not connection, re-check the various parts of the system.
4. Repeat steps 1, 2 and 3, disconnecting the second brake feedback signal from the corresponding input.

If the procedure is successful, the brake fault alarm will function properly.

Depending on the setting of the parameter 11204 brake activity an alarm is generated that can be a single warning or immediately blocking or can lock the drive at the end of the ride. If, depending on the activity set, the alarm does not activate as intended, then the various parts of the brake feedback control circuit must be checked.
With parameter 11204 set in Ignore the alarm is ignored and the drive normally starts at the arrival of the commands.
With parameter 11204 set in warning a warning appears on the keypad as soon as the brake feedback circuit is not consistent with the brake status.

With parameter 11204 set in deactivate drive the drive is immediately disabled as soon as the brake feedback circuit is not consistent with the brake status.
With parameter 11204 set in lift fast stop the drive is disabled as soon as the brake feedback circuit is not consistent with the brake status.
With parameter 11204 set in lift stop the drive is disabled at the end of the ride.

A.4.3 Maintenance of the failure function Brake

The installer will repeat the brake failure alarm test procedure following periodic plant inspections or brake indications. The installer will check the alarm log for any anomalies at any time.

The brake air alarm test procedure can also be carried out by closing the contact during the ride while the brake is still open. Depending on how the 11204 parameter is set, which defines how the lift should behave in the event of an alarm, the motor stops immediately or when the ride is over.

A.4.4 Troubleshooting

Fault	Possible cause	Solution
Motor does not run, the brake fault alarm is triggered continuously	Feedback signals disconnected/incorrectly connected	Re-check brake feedback signal wiring and electric levels
	Brake feedback not configured correctly	Check PAR 11236 **Brake fbk src,** PAR 11252 **Brake fbk A3 sel** configuration. Check correct signal operation (electric levels) and invert digital inputs if necessary
	Monitoring time too short in relation to system response times	Set a longer PAR 11206 **Brake Hold Off time**
The motor runs even with the feedback signals disconnected	The brake fault alarm is not connected.	Check the setting of PAR 11252 **Brake Fbk Sel A3**.
	Incorrect PAR 11252 **Brake fbk A3 sel** / PAR 11236 **Brake fbk src** setting.	PAR 11252 **Brake fbk A3 sel** and PAR 11236 **Brake fbk src** must not be set to **Null** or **Brake Cont Mon**.

A.5 - Asyncronous motor setup application note

A.5.1 Parameter programming

The ASY SSC operating mode, to be used when there is no possibility of connecting even a simple incremental encoder to an asynchronous motor, allows you to use asynchronous motors typically combined with gearbox with our inverters by exploiting the V/F control mode optimized with internal rotor speed estimators in each elevator operating sequence from start to finish. Alternatively is available the ASY SLS operation mode that instead o V/F control mode use an estimated filed oriented algorithm that permit more confortable trip and precise floor approach.
The internal slip and boost estimators at start and at low rpm are able to turn an asynchronous motor without encoder feedback without having to fiddle with various parameters. In most cases, if the electrical data of the motor and the mechanical data of the system are entered correctly, the motor already behaves well in all operating conditions. For older motors, fine tuning is resolved by fiddling with just one parameter.
Therefore, since the correct entry of the mechanical and electrical parameters is essential, we report below the list of the required parameters with an indication of how to identify them on the motor plates and on the winch plates.

The first operation to be done before even turning on the control panel is to recover the data present on the motor and gear plates followed by the main system data which can be recovered from the system booklet or from the Project.

From the electrical plate of the motor it is necessary to recover:

Data to be recovered	Value
Motor nominal voltage in star configuration [Vac]	
Motor nominal current in star configuration [A]	
Nominal speed of motor [rpm]	
Motor power supply nominal frequency [Hz]	
Polar couples	
Nominal power [kW o CV]	
Cos phi	

From the gear plate and from the Project it is necessary to recover:

Data to be recovered	Value
Car speed [m/s]	
Gerabox reduction ratio	

Data to be recovered	Value
Rope ratio	
Traction pulley diameter	
Total cabin weight	
Total weight of the counterweight	
Weight of the ropes	

Car, counterweight ad nominal load are used for an estimation of lift inertia that, expecially with ASY SLS, is important for correct behavious of motor that can then tune fining by learning trip procedure. All this data will be requested during the drive startup (setup) process. The next chapter shows how to locate the various required parameters from the motor and gearbox plates.

A.5.1.1 Motor electrical data

A.5.1.1.1 IPA 2000 Rated voltage

Enter the nominal voltage of the high speed windings of the motor. If there are multiple values, for example 220/380, enter the value of the voltage with which you want to power the motor. Generally in Europe the typical three-phase power supply is 380 Vac.

A.5.1.1.2 IPA 2002 Rated current

If you are unsure which current to insert from those on the nameplate, use the power data that should be on the nameplate and refer to the following formula:

$$I = \frac{P}{\sqrt{3} \cdot V \cdot \cos\phi \cdot \eta}$$

Where:
- Rad 3 =1.732
- (P in Watt) is the nominal power (example 5 kW= 5000 W)
- (V) is the supply voltage (example 380 V)
- (cosΦ) is the power factor (typically between 0.8 and 0.9)
- (η) it's the performance (typically between 0.85 and 0.95)

The value on the plate to be used is the one that is closest as possible to the calculated value without taking into account the efficiency (which is difficult to find on the plates) approximately I= P/592.

A.5.1.1.3 IPA 2004 Rated speed

The nominal speed to be entered is the asynchronous operating speed and is the one that should be indicated on the plate.
Be careful because on the plates the manufacturer could indicate as speed the synchronous one combined with the slip value for example 1500 rpm with slip 4% or slip 0.004 (the slip can be found as a percentage value or as an absolute value).
In this case the nominal speed to be entered is equal to the synchronous speed value x (1-slip).
Example 1500 x (1-0.04)=1440

The synchronous speed is obtained from the following formula:

ns=60*f/p

Where:
- (ns) is the synchronous speed in revolutions per minute (rpm),
- (f) is the network frequency in Hz (typically 50 in Europe and 60 in North America),
- (p) is the number of pole pairs.

So, be careful, if on the plate you find one of the following speeds indicated as nominal speeds then you have to go and look for the slip value on the motor plate

Pole pairs	Synchronous speed value at 50 Hz	Synchronous speed value at 60Hz
1	**3000**	**3600**
2	**1500**	**1800**
3	**1000**	**1200**
4	**750**	**900**
8	**375**	**450**

Pay attention to this step because if the synchronism speed is entered by mistake in parameter 2004, the internal slip compensation algorithm is effectively put out of play and even changing its values will not cause any changes in the motor's behavior, especially at low speed. Furthermore, entering the nominal speed incorrectly, in addition to

causing the slip compensation algorithm to function incorrectly, will alter the full scale speed and consequently also the acceleration ramps, varying their times.

A.5.1.1.4 IPA 2006 Rated frequency

In this parameter, the nominal frequency of the alternating voltage applied to the motor must be entered.

Motors with 60 Hz indication.
In the case in which a motor indicates 60 Hz as its nominal frequency, then in parameter 2006 this frequency must be entered, making sure that the nominal speed is related accordingly; for example, a 4-pole motor that reports on the plate a nominal frequency of 60 Hz and a nominal speed of 1750 rpm, being the synchronous speed with 60 Hz equal to 1800 rpm, we are sure that the indicated speed is the correct one to enter since it is the asynchronous speed with a slip of approximately 0.028.

A.5.1.1.5 IPA 2008 Pole pairs

In the drive, you are asked to enter the number of pole pairs that correspond to half of the number of poles. Therefore, if the pole pairs are indicated on the motor plate, this value is entered in the parameter. If are indicated the number of poles, the indicated value must be divided by 2.
To be sure of the number of pole pairs to enter, refer to the motor speed table. A motor that rotates at around 1500 rpm has 2 pole pairs and the parameter 2008=2.

A.5.1.1.6 IPA 2010 Rated power

The nominal power must be entered in parameter 2010 in kW. For example, if 5.5 kW is indicated on a motor, the value 5.5 must be entered in the parameter.
On plates that show the data of multiple windings, be careful to use the respective power indicated.
If the plate indicates a power with a unit of measurement CV (used for larger motors), then the value in kW to be entered in the parameter is obtained by multiplying the value in CV by 0.735.

A.5.1.1.7 IPA 2012 Cos phi

This value indicated on the plate indicates how efficient a motor is, i.e. how much electrical energy it can transform into mechanical energy and is a characteristic value of the motor depending on how it is built. If the value is not indicated on the plate, leave the default value present in the drive. Entering the correct value of this parameter makes the internal calculations of the drive more precise.

A.5.1.2 Mechanical data of the system

Regarding the mechanical data of the system that can impact the correct sizing (also with regards to the slowdown curves and the stop at the floor) we highlight the following:

A.5.1.2.1 IPA 11006 Cabin speed

In this parameter, the nominal speed of the cabin must be entered.

A.5.1.2.2 IPA 11010 Gearbox ratio

This parameter indicates the reduction ratio that is indicated on the gearbox plate. Usually a fraction x/y is indicated where x is the number of turns out of the gearbox slow shaft and y is the number of turns in the gearbox speedy shaft.
If x=1, for example 1/45 then the value to be inserted in parameter 11010 is 45 which indicates that for each turn of the traction pulley shaft the motor will make 45 turns
If instead x=3, for example 3/54 then the value to be inserted in parameter 11010 is =54/3=18 which indicates that for each turn of the traction pulley shaft the motor will make 18 turns.

A.5.1.2.3 IPA 11164 Rope ratio

The rope ratio indicates the number of sizes on the rope rotation of the cabin to reduce the power required from the motor (reducing the speed of the cabin). Normally this ratio with asynchronous motors is equal to 1, for large capacity systems such as freight elevators it may happen that pulleys are added on the cabin roof and at the head and, depending on the number of returns between the free pulleys, the ratio has a minimum value of 2 or greater. This value is not to be confused with the number of ropes or with the reduction ratio of the winch.

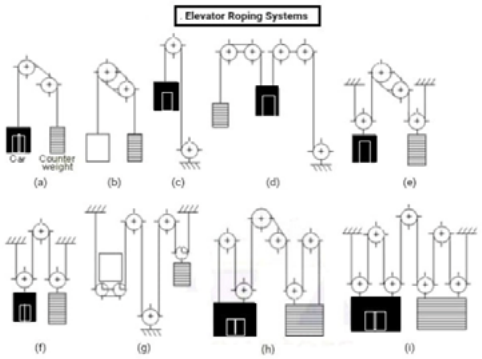


Fig.	Roping	Roping method	Principal use
a	1:1	Half wrap (single wrap)	Mid-, low-speed elevators
b	1:1	Full wrap (double wrap)	High-speed elevators
c	1:1	Drum winding	Home elevators
d	1:1	Drum winding	Small, low-speed elevators
e	2.1	Full wrap (double wrap)	High-speed elevators
f	2.1	Half wrap (single wrap)	Freight elevators
g	2.1	Half wrap (single wrap)	Machine-room-less elevators
h	3.1	Half wrap (single wrap)	Large freight elevators
i	4.1	Half wrap (single wrap)	Large freight elevators

A.5.1.2.4 IPA 11012 Pulley diameter

In this parameter, the diameter of the traction pulley connected to the slow shaft of the winch must be entered. The diameter of the pulley is indicated in the system booklet or in the project.

A.5.2 Adjusting the motor slip compensation

In order to function, asynchronous motors exploit the principle of the rotor field slipping with respect to the stator field imposed by the drive. Asynchronous motors by their nature have a slip that tends to increase as the number of revolutions of the motor decreases and as the load applied to the motor increases.
Furthermore, the V/F operating and SLS operation mode means that the voltage applied to the rotor is proportional to the rotation frequency of the motor and therefore for low speeds we also have a torque that tends to decrease.
For these reasons, the most critical points in the regulation of an asynchronous motor are in the slowdown and low speed phase when approaching the arrival plane.
To counteract the slippage inherent in the motor, the control algorithm reads the motor and mechanical data entered and the electrical data detected during the autotuning phase and then, for each stroke, reads the current required by the motor (and therefore estimates the applied load) and based on the values read tries to increase (if the motor tends to slow down) or decrease (if the motor is dragged) the speed of the rotating field of the stator, thus trying to compensate for the increase in slippage at low speeds. Slippage occurs both with the motor being dragged (for example arriving at the floor going up with an empty cabin) and with the motor pushing (for example arriving at the floor going down with an empty cabin).

A.5.2.1 Procedure to follow for the correct calibration of the asynchronous motor in ASY SSC mode

A.5.2.1.1 Preliminary operations

After having made sure that the electrical and mechanical data entered into the drive are correct and after having performed auto-tuning, we can start to perform arrival tests uphill and downhill always at the same intermediate floor, always with the cabin empty.

A.5.2.1.2 Choice of test floor and control of magnet positioning

Once the intermediate plane has been chosen around which to perform the arrival calibration tests, it is necessary to ensure that the deceleration magnets and the arrival magnets in ascent and descent are symmetrical with respect to the floor, also with regard to the overlapping part.
Through the parameter 14032 deceleration space we know at what distance to place the deceleration magnets in ascent and descent with respect to the intermediate floor. To be safe, place the magnets a few centimeters further away from the intermediate floor. It is necessary to remember that the value of parameter 14032 is calculated by the drive based on the speeds, ramps (accelerations, decelerations and jerks) and electrical and mechanical values entered and therefore varies every time one of these values is varied.

A.5.2.1.3 Assessment of the quality of arrival at the floor and corrective actions

At this point, by making calls to the intermediate floor in ascent and descent, you can see whether the cabin arrives long in both directions or only in one direction.
If the cabin arrives long at the floor and if you are sure of the distance at which the slowdown magnets have been placed, then it could be that the drive is not compensating enough at low speed: try increasing or decreasing the parameter 2214 V/Hz guad com scorr. Since this is a compensation for the slip (which is initially calculated by the drive), it is necessary to make changes in steps of very small values, approximately in steps of 0.005 both in increase and decrease with respect to the initial value (to be noted before starting to make the changes) and consequently verify that the arrival at the floor occurs with less and less slip.
If, by varying the value of parameter 2214 in one direction, we see that the slip increases instead of decreasing, then we return to the initial value and try to proceed in steps in the opposite direction.

A.5.2.1.4 Fine calibrations

Once the value for which the minimum slippage is obtained before a further increase of the same has been found, you can try to load the cabin at half load to see that even in this condition the arrival at the floor always occurs in the same way with the same distances.
Only after this level has been reached is it recommended to move on to the adjustment phase of the stop level both in ascent and descent by physically moving the two magnetic strips of the floor and to the adjustment phase of the slowdown point to minimize the movement phase of the cabin at low speed; in this regard, if you immediately see that the cabin has a lot of low speed both in ascent and descent, then immediately adjust the slowdown magnets by bringing them closer to the floor so as to then allow a finer adjustment because the more time the motor rotates at low speed, the more time it goes into compensation, consequently increasing the errors in arriving at the floor even with optimized compensations (the rotation speed of the motor is always an estimated speed because the drive, not having an encoder connected to the motor, can only make estimates of the speed). We also remember that the lower the low speed value, the more the drive struggles to compensate for slippage.

A.5.2.1.5 Calibrations to be performed in extreme cases

If, by modifying parameter 2214, it is not possible to visibly reduce the motor slippage with respect to the floor, then, if we see that the motor tends to slow down more and more until it stops without being given the stop command, if we are sure that the electrical and mechanical data entered are correct, it could be that:

1. The low speed set is too low for example below 5Hz; therefore try to increase the low speed (remembering to move the slowdown magnets according to the new low voltage speed set using parameter 14032 to define the new distance).
2. Only if increasing the low speed has not given benefits then it could be that the motor needs more power at low speed and that the automatic boost function IPA 2212 is not energetic enough then we can manually increase the calculated value of the gain IPA 2230 “V/Hz Boost gain. Since experience tells us that when you get to this point it is because some electrical or mechanical parameter was entered incorrectly, we suggest you do a further check of the parameters before changing the Gain in the IPA 2230.

A.5.2.1.6 A note on using the 2228 slip com hold parameter

This parameter enables an alternative management of the current in the slowdown phase that is no longer based on the currents measured during the slowdown phase but is based on an estimated current during the acceleration and high speed phases. The activation of this function must be done only with latest generation motors and/or with very low intrinsic slippage because otherwise it could lead to a worsening of the arrival at the floor.

A.5.2.2 Procedure to follow for the correct calibration of the ASY SLS mode

A.5.2.1.1 Preliminary operations

After having made sure that the electrical and mechanical data entered into the drive are correct and after having performed auto-tuning, we can start to perform arrival tests uphill and downhill always at the same intermediate floor, always with the cabin empty.

A.5.2.1.2 Choice of test floor and control of magnet positioning

Once the intermediate plane has been chosen around which to perform the arrival calibration tests, it is necessary to ensure that the deceleration magnets and the arrival magnets in ascent and descent are symmetrical with respect to the floor, also with regard to the overlapping part.
Through the parameter 14032 deceleration space we know at what distance to place the deceleration magnets in ascent and descent with respect to the intermediate floor. To be safe, place the magnets a few centimeters further away from the intermediate floor. It is necessary to remember that the value of parameter 14032 is calculated by the drive based on the speeds, ramps (accelerations, decelerations and jerks) and electrical and mechanical values entered and therefore varies every time one of these values is varied.

A.5.2.1.3 Assessment of the quality of arrival at the floor and corrective actions

If the cabin arrives long at the floor, and you are sure of the following conditions:

- The slowdown magnets are correctly positioned.
- The startup wizard was completed with the motor at normal ambient temperature.

Then, it is possible that the drive is not compensating enough at low speed.

You have three options to improve this:

1. Increase **Multi-Speed 0** (PAR 11020). If possible, try slightly increasing your slower multi-speed setting.
   For example, raise it from 4.78 Hz to 5.3 Hz.
   This helps to ensure the motor maintains enough torque at low speed.

2. Adjust the **Slip Compensator Coefficient** (PAR 2840). This parameter controls the slip compensation factor (default is 100%). Make small changes, in steps of approximately ±5% from the initial value (be sure to note the original setting before starting).
   After each adjustment, test if the cabin arrival improves.
   If increasing the parameter causes the slip to worsen (more overshoot), revert to the initial value and try reducing it instead. Continue this process step by step, aiming to minimize slip during floor arrival.

3. Change the **Slip Strategy** (PAR 2824). If you require a smoother journey, try changing the Slip Strategy parameter from 3.0 to 4.0. After this change, repeat option 2: fine-tune the Slip Compensator Coeff. (PAR 2840) again, following the same method as described above.

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